CHANDLER Catalogue of Variable Stars

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CATALOGUE OF VARIABLE STARS,

BY S. C. CHANDLER.

Thirteen years have passed since the appearance of SCHÖNFELD's *Second Catalogue of Variable Stars.* A work that shall represent the knowledge of to-day as that did the knowledge of its date is an urgent need of this branch of astronomy. The attainment of the same thoroughness of construction as for the catalogue of 1875 would require that it should emanate from the same hand: for any other to undertake the task might seem presumptuous, were the need not so immediate. I shall not apologize, therefore, for the attempt to meet the emergency partially, by the present catalogue, premising that it is to be regarded as a preliminary publication, the defects of which are to be remedied in a subsequent edition, when the series of observations and definitive investigations now in hand shall be completed.

This catalogue is not a mere compilation; otherwise it would scarcely be worth while to add to the number of lists which have appeared from time to time, constructed on the easy method of copying bodily the data of SCHÖNFELD's work, with additions engrafted thereupon which, sometimes at least, do not suggest a high degree of emulation of the conscientious and critical care of construction typical of the original work.

The preparation of the present work involved, as the first step, the collection of all the published observations of the known variables since their discovery, including the unpublished results of my own observations, which relate, at one time or another, nearly to the whole list of variables visible in this latitude. It is the more or less complete discussion of this material which has, in general, furnished the values of the elements of the light-variations assigned in the catalogue. Where the results of other investigators have been adopted, they have been scrupulously accredited, as hereinafter described.

In the eleventh and twelfth columns of the catalogue are given the maximum and minimum brightness, with their previously observed extremes, derived from a scrutiny of the data so collated, and expressed in the prevailing scale of magnitude, namely, that of the *Uranometria Nova*, the *Durchmusterung*, the *Uranometria Argentina*, and the *Southern Durchmusterung.* Where the data unavailable to SCHÖNFELD afforded no good reason for varying the limits given in his catalogue, the latter were retained unaltered, an asterisk being affixed thereto, to indicate this fact.

The elements in the thirteenth, fourteenth and fifteenth columns, namely, the principal epochs of minimum and maximum and the periods, together with the terms depending on the higher powers, or on periodic functions of the time, in the column of remarks, are the results of original investigation in all cases where an asterisk or dagger is not affixed to the period, in the fifteenth column. The asterisk denotes that SCHÖNFELD's elements have been adopted, either from his catalogue, or from his subsequent determinations; a course which I have followed whenever it was manifest, upon examination, that no essential improvement could be obtained from the observations now at hand, or that the time required for the calculation of new elements would too long delay the publication of the present edition of this catalogue. Similarly, a dagger is affixed wherever the elements depend on any other authority, quoted in the column of remarks.

Lest it might appear that there are exceptions to the truth of the above statement, and that there are numerous cases in which credit is not here given, it is necessary to say that the list of variables published by Professor PICKERING in 1884, and reprinted from year to year, was simply copied from my catalogue in one of its earlier stages. The manuscript for this, prepared for my private use, I lent to him with permission to employ it as he pleased, disclaiming, however, responsibility for the manner in which it appeared. This accounts for the fact that many of the elemen' ·ere given for the variables discovered since 1875 are identical with values which have already appeared elsewhere, but are not here distinguished by a dagger.

The results of my investigations upon the elements here incorporated are of very different orders of approximation to what may be considered the best attainable nu merical values. Sometimes they were reached sin y

comparing the observations since 1875, or thereabouts, with SCHÖNFELD's elements, and finding the new epoch from the mean of these corrections, and the new period from the comparison of this with his epoch. In a far larger number of instances, however, the discussion was of a more elaborate character, partaking of the nature of a definitive computation in many cases. I have already printed, in various places, the details of some of these determinations, and shall do the same for others as opportunity serves. I hope to be able, within a year or so, to issue a second edition of this catalogue which shall contain final elements of all the known variables, and which shall also be more precise and complete in other respects.

An analysis of the catalogue shows that, of the two hundred and twenty-five stars comprised in it, one hundred and sixty are distinctly periodic. In twelve others the periodic character is rather uncertainly defined. Fourteen are distinctly irregular, that is, are either not periodic or follow highly complicated and totally unrecognizable laws. Twelve belong to the so-called *Novae*, or have been seen at only one appearance. In regard to the remaining twenty-seven, little or nothing is known of the character of the fluctuations, the stars having been very little observed. Of the one hundred and sixty periodical variables I have been able to assign in the catalogue both maximum and minimum epochs for sixty-three stars: maximum epochs alone, for eighty-two; minimum epochs alone, for fourteen, nine of these being of the *Algol*-type; while in one the period alone is given.

The elements of one hundred and twenty-four stars are the results of my own investigations; for twenty-two I have adopted those of SCHÖNFELD, and for fourteen those of ARGELANDER, GOULD, PARKHURST, or others, after independent examination had shown that the data at hand would not give essentially improved values.

In about one-quarter of the whole number of periodical variables for which elements are given, I have found distinct evidence of systematic departure from uniformity of period. In more than a score of these instances the deviations have a character sufficiently pronounced to enable me to develop the numerical values of the constants of periodic or secular terms, with greater or less certainty; and these functions of the epoch have been inserted in the catalogue, either in the column containing the periods or in the remarks, as the convenience of the available space served.

It is of interest to recapitulate the present state of our knowledge in respect to these curious perturbations, the development of which is so important for the study of the causes of stellar variation. I have therefore collected in the following table, by what seems to be the most perspicuous form of statement, the inequalities incorporated in the elements of the catalogue. The arrangement is in order of the length of the period in the third column, which, with its variation in the fourth column, are the values of the first and second derivatives, respectively, of the elements of the catalogue; and therefore correspond to the instant of the beginning of the epoch E, reckoned from the zero of the principal epoch of maximum or minimum of the catalogue.

No.	Star	Period	Variation of Period	A = Eθ + G θ	G
		d d	d	°	°
4826	R Hydrae	496.91+6.043 cos A	—0.453 sin A	4.3	353.7
		—0.461 E	—0.461		
		—0.004 E²	—0.008 E		
8600	R Cassiopeae	429.00+6.423 cos A	—1.793 sin A	16.0	346.0
7120	χ Cygni	406.04+0.011 E	+0.011		
8512	R Aquarii	387.16+6.110 cos A	—1.066 sin A	10.0	235.0
8290	R Pegasi	378.10+0.340 E	+0.340		
3477	R Leonis min.	373.50—0.066 E	—0.066		
5501	S Serpentis	365.25+4.801 cos A	—0.419 sin A	5.0	30.0
5677	R Serpentis	357.60+3.927 cos A	—0.343 sin A	5.0	15.0
2946	R Cancri	352.81+0.414 E	+0.414		
6849	R Aquilae	352.30—0.800 E	—0.800		
806	o Ceti	331.34+1.555 cos A	—0.037 sin A	1.36	179.8
		+1.210 cos A	—0.043 sin A	2.05	70.1
		+1.296 cos A	—0.093 sin A	4.09	31.25
7220	S Cygni	323.30—0.134 E	—0.134		
5770	R Herculis	318.40+4.189 cos A	—0.877 sin A	12.0	324.0
6044	S Herculis	309.00+7.201 cos A	—0.943 sin A	7.5	100.0
3825	R Ursae Maj.	305.40—0.150 E	—0.150		
4557	S Ursae Maj.	223.92+0.204 E	+0.204		
3994	S Leonis	184.95+0.260 E	+0.260		
6512	T Herculis	164.75+0.628 cos A	—0.079 sin A	7.2	57.6
4521	R Virginis	145.63+0.545 cos A	—0.024 sin A	2.5	135.0
		+0.353 cos A	—0.028 sin A	5.0	65.0
7560	R Vulpeculae	136.90+1.396 cos A	—0.097 sin A	4.0	90.0

No.	Star	Period	Variation of Period	A = Eθ + G θ	G
		d h m s	s	°	°
6758	β Lyrae	12 21 46 58.3			
		+0.8434 E	+0.8434		
		—0.0002 E^2	—0.0003 E		
1090	β Persei	2 20 48 55.425			
		+3.6296 cos A	—0.0012 sin A	0.02	202.5
		+1.4137 cos A	—0.0018 sin A	0.075	203.25
		+0.6109 cos A	—0.0018 sin A	0.167	90.13
6189	U Ophiuchi	0 20 7 41.600			
		—0.0004 E	—0.0004		

Besides the stars in the foregoing table, I have detected distinct evidence of similar systematic inequalities, but without attempting to determine the mathematical expressions of them, in the following cases: *S Cassiopeae*, *R Arietis*, *R Tauri*, *V Tauri*, *R Leporis*, *R Aurigae*, *R Canis minoris*, *S Canis minoris*, *R Leonis*, *R Corvi*, *T Ursae Majoris*, *S Virginis*, *R Scorpii*, *U Herculis*, *T Delphini*, *T Pegasi;* besides the well known case of *R Scuti*. And it is appropriate to add here that there are puzzling discordances between the minima of the *Algol*-type variable *Y Cygni* observed in different years, for which I can see at present no explanation.

The fact that a large proportion of the variable stars are more or less red attracted attention early in the history of the subject; and that some sort of connection between color and variability really exists is now commonly accepted, although the nature of the relation is not at all understood. It seems proper, therefore, that a statement of the degree of redness, expressed in some convenient, although arbitrary, numerical scale, should find place in a catalogue of these objects. In the tenth column I have attempted to do this as well as the material furnished by my observations will permit. In 1883 and 1884 I made a series of about one thousand estimates, by two independent methods, upon about one hundred and twenty of the telescopic periodical variables, directed to this special end. Being a continuous series, made with the same instrument ($6\frac{1}{4}$-inch Clacey equatorial), they have a homogeneity which fits them to serve as a basis of classification of the variables as to redness, until something better can be provided. The details of this investigation will soon be published. The results are given in the tenth column in the figures not in parentheses. The redness is expressed to tenths of a degree of an arbitrary decimal scale, the zero of which corresponds to white light, and the other limit, ten, to the most intense shade of red of which we have cognizance in the heavens, exemplified by such stars as *S Cephei*, *V Cygni* and *R Leporis*. As nearly as the intermediate degrees of this imaginary scale can be verbally defined, 1 corresponds to the slightest perceptible admixture of yellow with the white; 2 to a yellow; 3 to yellowish orange; 4 to a full orange or orange-red; and 5 to 10 to increasing shades of intensity up to the limit described. The results are stated to tenths of the unit, not to imply that they possess by any means that order of accuracy, but simply as the casual average of the estimates. The values for the stars not included in this series are in parentheses; and are merely rude attempts to assign their redness in the same scale, from estimates made at other times, or, where these were wanting, from descriptions by other observers. Two remarks should be added; first, that my scale was formed independently of, and without reference to Schmidt's, and that I am not now prepared to define the relation between the two; and secondly, that I am fully aware how vague and defective this method, of estimate by reference to an arbitrary imaginary scale, is. But it is at least a beginning, if a rude one. The whole subject is beset with great difficulties, and needs thorough study by correct methods.

The places of the stars of Schönfeld's catalogue were taken directly therefrom (correcting a misprint in *η Geminorum*), and those of the additional stars from the most trustworthy available sources. The equinox of 1855 is retained, as it is still, on the whole, the most convenient. On the right hand page, however, are approximate places for 1900, which equinox will be adopted as the fundamental one in some future edition, and which has been made the basis of the method of numbering about to be described.

In the outside columns of both the right and left hand pages is the number of the star, upon a system of ordinal notation designed to remedy the inconveniences attending the usual current numbers. The variables are increasing so rapidly in number that successive editions of catalogues must in future succeed each other more frequently than in the past, to serve the convenience of astronomers. A new current number with each list necessitates a reference column, for identification, of the numbers of some preceding one; or, if the numbers of any one list are retained, the interpolated stars require a suffix-letter, resulting in a hybrid notation which is exceedingly objectionable, and which sooner or later has to be re-formed; when the whole process of degeneration, with its awkwardness and confusion, begins anew. It seems certainly better to adopt a system which attaches a permanent numeral to each star, and which permits interpolation to a practically unlimited extent. I would accordingly suggest that the numbers for variable star catalogues be

(*Continued on page 12.*)

No.	Sch.	Star	1855.0 R.A. h m s	1855.0 Decl. ° ′	Annual Variation s	Annual Variation ′	Discoverer	Date	Redness	Magnitude Max.	Magnitude Min.
100		T Ceti	0 14 26	—20 51.8	+3.04	+0.33	Chandler	1881	(4)	5.1– 5.3	6.4– 7.0
107	1	T Cassiopeae	15 25	+54 59.3	3.20	0.33	Krueger	1870	7.3	7.0– 8.0	11.0–11.2*
112	2	R Andromedae	16 25	+37 46.4	3.14	0.33	Argelander	1858	5.0	5.6– 8.6*	<12.8 *
114	3	S Ceti	16 41	—10 7.9	3.05	0.33	Borrelly	1872	2.0	7.0– 8.0*	<12.5
116	4	B Cassiopeae	16 47	+63 20.6	3.27	0.33	Tycho Brahe	1572		>1 *	? *
161	5	T Piscium	24 29	+13 48.0	3.11	0.33	Luther	1855	(0)	9.5–10.2*	10.5–11.0*
209	6	α Cassiopeae	32 18	+55 44.5	3.36	0.33	Birt	1831	(5)	2.2 *	2.8 *
224		Andromedae	34 49	+40 28.3	3.25	0.33	Hartwig	1885	(5)	7	0?
243		U Cassiopeae	38 16	+47 27.8	3.31	0.33	Espin	1887	(6)	8½?	14?
320		U Cephei	0 49 39	+81 5.6	4.90	0.33	Ceraski	1880	(0)	7.1	9.2
432	7	S Cassiopeae	1 9 4	+71 50.8	4.30	0.32	Argelander	1861	6.7	6.7– 8.6	<13.5
434	8	S Piscium	10 0	+ 8 9.9	3.12	0.32	Hind	1851	1.0	8.2– 9.3	13.5?
466		U Piscium	15 18	+12 6.4	3.16	0.32	Peters	1880		10	<14
494		R Sculptoris	20 17	—33 17.8	2.77	0.31	Gould	1872?	(9)	5¾	7¾
513	9	R Piscium	23 10	+ 2 7.9	3.09	0.31	Hind	1850	2.0	7– 8.8	<12.5 *
715	10	S Arietis	1 56 51	+11 49.7	3.21	0.29	Peters	1865	(2)	9.1– 9.8*	14?
782	11	R Arietis	2 7 53	+24 22.8	3.39	0.28	Argelander	1857	1.8	7.6– 9.0	11.7–13.0
793		T Persei	9 0	+58 16.7	4.23	0.28	Safarik	1882	(4)	8.2	9.3
806	12	o Ceti	12 1	— 3 38.3	3.02	0.28	Fabricius	1596	5.9	1.7– 5.0*	8– 9.5
814	13	S Persei	12 29	+57 55.2	4.24	0.28	Krueger	1873	5.0	8.5	12.5
845	14	R Ceti	18 38	— 0 50.1	3.06	0.28	Argelander	1866	2.4	7.5– 8.8	13.5
893		U Ceti	26 45	—13 47.2	2.88	0.27	Sawyer	1885	(3)	6.8– 7.3	10.5<
976	15	T Arietis	40 15	+16 54.1	3.33	0.26	Auwers	1870	3.2	7.9– 8.6	9.3– 9.7
1072	16	ρ Persei	55 54	+38 16.5	3.81	0.24	Schmidt	1854	(2)	3.4 *	4.2 *
1090	17	β Persei	2 58 45	+40 23.6	3.87	0 24	Montanari Goodricke	1669 1782	(0)	2.3	3.5
1222	18	R Persei	3 20 50	+35 10.1	3.79	0.21	Schönfeld	1861	2.3	7.7– 9.2	13.5
1411	19	λ Tauri	3 52 39	+12 4.6	3.31	0.18	Baxendell	1848	(0)	3.4 *	4.2 *
1537	20	T Tauri	4 13 33	+19 11.3	3.49	0.15	Hind	1861	(0)	9.2–11.5*	12.8-<13.5
1574		W Tauri	19 43	+15 46.5	3.41	0.14	Espin	1886	(5)	9?	<12½
1577	21	R Tauri	20 21	+ 9 50.1	3.28	0.14	Hind	1849	4.5	7.4– 9.0*	13.5
1582	22	S Tauri	21 16	+ 9 37.3	3.28	0.14	Oudemans	1855	2.5	9.5–10.0	<13.5
1654		R Doradus	35 5	—62 21.8	0.69	0.12	Gould	1874?	(7)	5½	6¾
1717	23	V Tauri	43 39	+17 17.4	3.46	0.11	Auwers	1871	3.3	8.3– 9.0*	<13.5
1761	24	R Orionis	51 8	+ 7 54 3	3.25	0.10	Hind	1848	4.4	8.7– 9.1	<13 *
1768	25	ε Aurigae	51 34	+43 36.2	4.29	0.10	Fritsch	1821	(1)	3.0 *	4.5 *
1771	26	R Leporis	4 53 0	—15 1.7	2.73	0.10	Schmidt	1855	9.4	6– 7 *	8.5? *
1855	27	R Aurigae	5 5 36	+53 25.0	4.82	0.08	At Bonn	1862	6.5	6.5– 7.8	12.5–12.7*
1923		S Aurigae	17 33	+34 2.1	3.96	0.06	Dunér	1881	6.7	9.4–11.0	<14.5
1944	28	S Orionis	21 51	— 4 48.7	2.96	0.06	Webb	1870	6.4	8.3– 9.5	13.0
1961	29	δ Orionis	24 36	— 0 24.6	3.06	0.05	J. Herschel	1834	(0)	2.2? *	2.7 *
1986		T Orionis	28 43	— 5 34.5	2.94	0.05	Bond	1863	(0)	9.7	13
2100		U Orionis	47 13	+20 8.7	3.56	0.02	Gore	1885	(7)	6.4– 7.5	<12
2098	30	α Orionis	5 47 19	+ 7 22.9	3.25	+0.02	J. Herschel	1840	(6)	1 *	1.4 *
2213	31	η Geminorum	6 6 8	+22 32.6	3.62	—0.01	Schmidt	1865	(3)	3.2 *	3.7– 4.2*
2266		V Monocerotis	15 25	— 2 7.6	3.02	0.02	Schönfeld	1883	3.4	6.9	10.7<
2279	32	T Monocerotis	17 24	+ 7 9.7	3.24	0.03	Gould	1871	(2)	5.8– 6.4	7.4– 8.2
2362	33	R Monocerotis	31 15	+ 8 51.7	3.28	0.05	Schmidt	1861	(0)	9.5 *	13
2375	34	S Monocerotis	33 0	+10 1.5	3.31	0.05	Winnecke	1867	(2)	4.9 *	5.4 *
2478	35	R Lyncis	49 20	+55 31.6	4.97	0.07	Krueger	1874	4.8	7.8– 8.0	<13
2509	36	ζ Geminorum	55 30	+20 46.7	3.56	0.08	Schmidt	1847	(2)	3.7 *	4.5 *
2528	37	R Geminorum	6 58 37	+22 55.4	3.62	0.08	Hind	1848	5.7	6.6– 7.8	<13.5
2539	38	R Canis min.	7 0 44	+10 14.9	3.30	0.09	At Bonn	1855	5.5	7.2– 7.9*	9.5–10.0*
2583		L_2 Puppis	9 7	—44 24.2	1.82	0.10	Gould	1872	(8)	3.5	6.3
2610		R Canis Maj.	12 55	—16 7.6	2.70	0.10	Sawyer	1887	(0)	5.9	6.7
2625		V Geminorum	15 2	+13 21.9	3.37	0.11	Baxendell	1880	2.8	8.2– 9.1	12.0–14.0
2676	39	U Monocerotis	23 53	— 9 28.6	2.86	0.12	Gould	1873	(3)	5.9– 7.3	6.6– 8.0
2684		S Canis min.	7 24 51	+ 8 37.4	+3.26	—0.12	Hind	1856	4.1	7.2– 8.0*	<11 *

Greenwich Mean Time Min.	Greenwich Mean Time Max.	Period, etc.	Remarks	1900.0 R.A.	1900.0 Decl.	No.
d h m	d h m	d h m s		h m	° ′	
. . . .	. . . .	65 ?	Irregular; possibly, type of R Scuti	0 16.7	—20 37	100
83 Dec. 8	84 Aug. 10	+441 E		17.8	+55 14	107
. . . .	82 Oct. 22.9	+411.2 E		18.8	+38 1	112
. . . .	88 Nov. 13	+322.5 E		19.0	— 9 53	114
. . . .	. . . .	. . . .	Nova	19.2	+63 35	116
. . . .	. . . .	. . . .	Irregular	26.8	+14 3	161
. . . .	. . . .	. . . .	Irregular. Argel. found per. 79d	34.8	+55 59	209
. . . .	. . . .	. . . .	Nova in Andromeda Nebula	37.2	+40 43	224
. . . .	. . . .	. . . .		40.5	+47 43	243
88 Jan. 2 23 20.0	. . . .	+ 2 11 49 45.0 E	Algol-type	0 53.4	+81 20	320
. . . .	88 Apr. 27.5	+607.5 E	I think period is shortening	1 12.3	+72 5	432
. . . .	88 Mar. 31.7	+406.0 E		12.3	+ 8 24	434
. . . .	85 Sept.	+352 E †	Elements uncertain; Parkhurst	17.7	+12 21	466
72 Aug. 21 ?	72 Dec. 7 ?	+207 E	Elements inferred from Cordoba obser. Sawyer has confirmed variability	22.4	—33 4	494
. . . .	81 Dec. 24.0	+344.0 E		25.5	+ 2 22	513
. . . .	72 Mar. 14.0	+290.0 E		1 59.2	+12 3	715
81 Sept. 27.6	82 Jan. 6.5	+186.7 E	I suspect a shortening of period	2 10.4	+24 35	782
. . . .	. . . .	. . . .	Light-curve irregular	12.2	+58 29	793
66 Aug. 8	66 Nov. 25.47	+331.3363 E+ †	+18d .16 sin(45/11° E+ 31° 15′) +33 .90 sin(45/22° E+ 70 5) +65 .31 sin(15/11° E+ 179 48) Argel. elements, omitting 10-year term	14.3	— 3 26	806
. . . .	73 Nov. 30	+346 E		15.7	+58 8	814
. . . .	70 Oct. 31.4	+167.1 E *		20.9	— 0 38	845
. . . .	84 Dec. 11	+233 E		28.9	—13 35	893
72 Nov. 8	73 Mar. 11	+324 E *		42.7	+17 6	976
. . . .	. . . .	33	Schmidt's period. Schoenfeld thinks the var. irregular	2 58.7	+38 27	1072
88 Jan. 3 7 21 29.23	. . . .	+ 2 20 48 55.425 E′+	+173m .3 sin(1/50 E′+202° 30′) + 18 .0 sin(5/40 E′+203 15) + 3 .5 sin(1/6 E′+ 90 20); where E′ = E —11210	3 1.6	+40 34	1090
. . . .	82 June 20.0	+210.4 E		23.7	+35 20	1222
87 Dec. 6 11 57.0	. . . .	+ 3 22 52 12.0 E	Algol-type: period subject to marked inequalities	3 55.1	+12 12	1411
. . . .	. . . .	. . . .	Irregular	4 16.2	+19 18	1537
. . . .	. . . .	. . . .		22.3	+15 53	1574
. . . .	81 Nov. 26.9	+325.0 E		22.8	+ 9 56	1577
. . . .	83 Oct. 25	+376 E	Elements uncertain	23.7	+ 9 44	1582
. . . .	. . . .	. . . .		35.6	—62 16	1654
. . . .	83 Nov. 7	+169.2 E	I suspect variation from uniform period	46.2	+17 22	1717
. . . .	69 Oct. 18.6	+378.8 E *		53.6	+ 7 59	1761
. . . .	. . . .	. . . .	Irregular	54.8	+43 41	1768
79 Jan. 24	79 Sept. 13.0	+436.1 E	Evidence of inequality in period	4 55.0	—14 57	1771
77 May 25	78 Jan. 6.0	+460.6 E	Period probably irregular	5 9.2	+53 29	1855
. . . .	. . . .	. . . .	I think period is certainly over 400 days, but very irregular; possibly with secondary phases	20.5	+34 5	1923
69 July 1	70 Jan. 17	+416 E	Possibly a secondary max. midway	24.1	— 4 46	1944
. . . .	. . . .	. . . .	Auwers found a 16d period; Schoenfeld found a slight variation, but no period. My obsns. and Sawyer's show no fluctuation of light	26.9	— 0 22	1961
. . . .	. . . .	. . . .	In Great Nebula; Schmidt's obsns. and mine confirm variability	30.9	— 5 32	1986
. . . .	85 Dec. 15	+359.5 E †	Duner's elements	49.9	+20 10	2100
. . . .	. . . .	. . . .	Argelander found period 196 days. Schoenfeld thinks periodicity questionable	5 49.7	+ 7 23	2098
70 April 7	. . . .	+229.1 E *		6 8.8	+22 32	2213
. . . .	84 Jan. 1	+334 E		17.7	— 2 9	2266
85 Mar. 24.88	85 Apr. 1.81	+ 27.0037 E	Limits of mags. from Sawyer's obsns.	19.8	+ 7 8	2279
. . . .	. . . .	. . . .	Irregular; in southerly end of the nebular h (399)	33.7	+ 8 49	2362
70 Feb. 2 10.4 ?	70 Jan. 31 19.9 ?	+ 3 10 38 E? †	Winnecke's elements; Schoenfeld's obsns. partly confirm such a period, partly contradict it	35.8	+ 9 59	2375
83 Aug. 20	84 Jan. 26	+380.0 E	Elements uncertain	53.1	+55 29	2478
87 Dec. 29 14 5.7	88 Jan. 3 14 27.7	+ 10 3 41.5 E	W. M. Reed's obsns. indicate a correction to Schoenfeld's period of —1m 48s, Yendell's one of about —30s. I have adopted —1m 22s	6 58.2	+20 43	2509
78 Jan. 0	78 Apr. 18.0	+370.5 E		7 1.3	+22 52	2528
76 Apr. 28	76 Aug. 20	+337.5 E	There is evidence of inequality of period	3.2	+10 11	2539
78 Jan. 4	78 Mar. 16.0	+136.05 E †	Williams's elements of max.; min. inferred from Gould's remarks in U.A.	10.5	—44 29	2583
87 Mar. 26 14 58.5	. . . .	+ 1 3 15 55 E	Algol-type	14.9	—16 12	2610
79 Sept. 24	80 Feb. 7	+276.0 E		17.6	+13 17	2625
73 Apr. 1.0	73 Apr. 19.0	+ 45.20 E	Limits of mag. from Sawyer's obsns., which show light-curve resembling R Scuti; Yendell's obsns. confirm	26.0	— 9 34	2676
. . . .	79 Aug. 20	+331.0 E	Schoenfeld thought period was shortening, in 1875; but my results show rather a cyclical irregularity	7 27.3	+ 8 32	2684

No.	Sch.	Star	1855.0 R.A.	1855.0 Decl.	Annual Variation		Discoverer	Date	Red-ness	Magnitude Max.	Magnitude Min.
			h m s	° ′	s	′					
2691	40	T Canis min.	7 25 56	+12 3.0	+3.34	—0.12	Schönfeld	1865	(2)	9.0– 9.7	<13.5
2735		U Canis min.	33 28	+ 8 42.2	3.26	0.13	Baxendell	1879	5.1	8.5– 9.0	12.3–13.5
2742	41	S Geminorum	34 20	+23 47.2	3.61	0.13	Hind	1848	(3)	8.2– 8.7*	<13.5
2780	42	T Geminorum	40 36	+24 5.5	3.61	0.14	Hind	1848	3.0	8.1– 8.7*	<13.5
2783		S Puppis	42 31	—47 45.4	1.74	0.14	Gould	1872?		7¼	9
2815	43	U Geminorum	46 30	+22 22.7	3.56	0.15	Hind	1855	0.0	8.9– 9.7*	13.1 *
2857		U Puppis	7 54 2	—12 26.6	2.81	0.16	Pickering	1881	3.2	8.5– 9.0	< 14
2946	44	R Cancri	8 8 34	+12 10.1	3.32	0.18	Schwerd	1829	5.3	6.0– 8.3	<11.7 *
2976	45	V Cancri	13 27	+17 44.5	3.43	0.18	Auwers	1870	4.3	6.8– 7.7	<12 *
3060	46	U Cancri	27 28	+19 23.5	3.45	0.20	Chacornac	1853	2.3	8.4–10.6	<13 *
3109	47	S Cancri	35 39	+19 33.2	3.44	0.21	Hind	1848	(1)	8.2 *	9.8 *
3170	48	S Hydrae	46 0	+ 3 36.8	3.13	0.22	Hind	1848	2.1	7.5– 8.7	<12.2 *
3186	49	T Cancri	48 23	+20 24.1	3.44	0.22	Hind	1850	7.4	8.0– 8.5	9.3–10.5*
3184	50	T Hydrae	8 48 37	— 8 35.4	2.92	0.22	Hind	1851	1.8	7.0– 8.1*	<13.0
3418		R Carinae	9 28 36	—62 8.9	1.52	0.26	Gould	1871	(5)	4.3– 5.7	9.3–10.0
3477	51	R Leonis min.	36 52	+35 10.6	3.62	0.27	Schönfeld	1863	6.0	6.1– 7.8	<12.5
3493	52	R Leonis	39 45	+12 5.9	3.23	0.27	Koch	1782	6.9	5.2– 6.7	9.4–10.0*
3495		*l* Carinae	41 16	—61 50.4	1.65	0.27	Gould	1871		3.7	5.2
3567		V Leonis	9 51 57	+21 57.3	3.36	0.28	Becker	1882	1.7	8.6	<13.5
3633		R Antliae	10 3 30	—37 1.2	2.58	0.29	Gould	1872		6.5	<8
3637		S Carinae	4 45	—60 50.4	1.92	0.29	Gould	1871	(5)	6¼	9
3712		U Leonis	16 17	+14 44.1	3.23	0.30	Peters	1876		9.5	<13.5
3796		U Hydrae	30 24	—12 38.1	2.96	0.31	Gould	1871	(7)	4.5	6.1– 6.3
3825	53	R Ursae Maj.	34 19	+69 32.1	4.38	0.31	Pogson	1853	1.6	6.0– 8.2	13.2
3847	54	η Argus	39 27	—58 55.4	2.31	0.31	Burchell	1827	(5)	>1 *	7.4
3881		V Hydrae	44 34	—20 28.8	2.91	0.32	{Gould Chandler}	{1874? 1888}	(9)	6.7	9.1<
3890		W Leonis	45 58	+14 29.2	3.18	0.32	Peters	1880		9?	<14
3934	55	R Crateris	10 53 26	—17 32.8	2.95	0.32	Winnecke	1861	8.1	>8 *	<9 *
3994	56	S Leonis	11 3 21	+ 6 14.9	3.11	0.32	Chacornac	1856	0.0	9.0–10.0	<13 *
4160	57	T Leonis	31 0	+ 4 10.5	3.08	0.33	Peters	1862		10? *	<13.5
4300	58	X Virginis	54 25	+ 9 52.7	3.08	0.33	Peters	1871		7.8? *	12
4315	59	R Comae	11 56 49	+19 35.4	3.08	0.33	Schönfeld	1856	4.0	7.4– 8.0*	<13.5
4377	60	T Virginis	12 7 10	— 5 13.8	3.08	0.33	Boguslawski	1849	4.1	8.0– 8.8*	10–<13.5
4407	61	R Corvi	12 8	—18 26.9	3.09	0.33	Karlinski	1867	3.7	6.8– 7.7	<11.5 *
4492		Y Virginis	26 25	— 3 37.3	3.08	0.33	Henry	1874	3.6	8– 9.4	13–14
4511	62	T Ursae Maj.	29 47	+60 17.2	2.77	0.33	At Bonn	1860	2.0	6.7– 8.5	12.2–12.6
4521	63	R Virginis	31 9	+ 7 47.2	3.05	0.33	Harding	1809	1.3	6.5– 8.0	9.7–11.0
4536		R Muscae	33 17	—68 36.7	3.56	0.33	Gould	1871		6.6	7.4
4557	64	S Ursae Maj.	37 35	+61 53.3	2.66	0.33	Pogson	1853	3.2	7.0– 8.2	10.2–11.5
4596	65	U Virginis	12 43 45	+ 6 20.6	3.04	0.33	Harding	1831	1.1	7.7– 8.1*	12.2–12.8*
4805	66	W Virginis	13 18 33	— 2 37.4	3.09	0.31	Schönfeld	1856	0.4	8.7– 9.2*	9.8–10.4*
4816	67	V Virginis	20 19	— 2 25.2	3.09	0.31	Goldschmidt	1857	2.7	8.0– 9.0*	<13 *
4826	68	R Hydrae	21 48	—22 31.8	3.27	0.31	{Montanari Maraldi}	{1672? 1704}	5.9	3.5– 5.5	9.7
4847	69	S Virginis	25 26	— 6 26.8	3.13	0.31	Hind	1852	2.6	5.7– 7.8*	12.5 *
4948		R Canum Venat.	42 43	+40 15.9	2.58	0.30	Espin	1888		7½	<11
5037		RR Virginis	13 57 12	— 8 30.0	3.17	0.29	Peters	1880		>11	<14
5070		Z Virginis	14 2 33	—12 36.5	3.22	0.29	Palisa	1880		9.5– 11	<14
5095		R Centauri	6 10	—59 14.1	4.24	0.28	Gould	1871	(6)	6.0– 6.3	8.7– 9.8
5097	70	T Bootis	7 18	+19 44.7	2.81	0.28	Baxendell	1860		9.7? *	<13 *
5156		X Bootis	17 19	+16 58.8	2.84	0.28	Baxendell	1859	(4)	9.0– 9.4	10.2
5157	71	S Bootis	18 1	+54 28.3	2.01	0.28	At Bonn	1860	2.8	7.7– 8.5	12.5–13.2
5194		V Bootis	23 54	+39 30.4	+2.42	0.27	Dunér	1884	3.6	7.1– 7.3	9.4
5190	72	R Camelopardi	28 54	+84 29.2	—5.31	0.27	Hencke	1858	2.1	7.8– 8.6	12–13.5
5237	73	R Bootis	30 48	+27 22.1	+2.65	0.26	At Bonn	1858	2.7	5.9– 7.8	11.3–12.2*
5249		V Librae	14 32 18	—17 1.8	+3.32	—0.26	Schönfeld	1882		9.3	12.2

Greenwich Mean Time Min.	Greenwich Mean Time Max.	Period, etc.	Remarks	1900.0 R.A.	1900.0 Decl.	No.
d h m	d h m	d h m s		h m	° ′	
. . . .	72 Feb. 3.6	+322.1 E *		7 28.4	+11 58	2691
79 Aug. 27	80 Mar. 15	+398.6 E		35.9	+ 8 36	2735
. . . .	65 Nov. 3.2	+294.2 E *		37.0	+23 41	2742
. . . .	63 Feb. 18.3	+288.1 E *		43.3	+23 59	2780
. . . .		. . . .		43.8	—47 52	2783
. . . .	79 Oct. 24	+ 86.3 E	Law of period very complicated. The elements given represent obsns. since 1879, but with considerahle deviations	49.2	+22 16	2815
. . . .	81 Mar. 8	+310 E		7 56.1	—12 34	2857
. . . .	52 Apr. 21.1	+352.81 E+0.207 E^2	A lengthening of the period seems beyond doubt	8 11.0	+12 2	2946
. . . .	84 Jan. 8.5	+271.5 E		16.0	+17 36	2976
. . . .	84 Mar. 18.6	+305.2 E		30.0	+19 14	3060
67 Aug. 31 14 2.89	. . . .	+ 9 11 37 45 E *	Algol-type	38.2	+19 24	3109
. . . .	78 Mar. 18.3	+256.5 E		48.3	+ 3 27	3170
72 Aug. 2	. . . .	+482 E	Elements uncertain	51.0	+20 14	3186
. . . .	66 Jan. 26.5	+289.4 E *		8 50.8	— 8 45	3184
. . . .	71 July 26.1	+312.14 E		9 29.7	—62 21	3418
. . . .	65 Feb. 20.0	+373.5 E—0.033 E^2	The shortening of the period seems clearly proved	39.6	+34 58	3477
80 Apr. 2.4	80 Aug. 28.4	+312.87 E	I find good evidence of cyclical variation of period, with a long term.	42.2	+11 54	3493
71 July 12	71 Aug. 1	+ 31.0 E		42.5	—62 3	3495
. . . .	82 April	+280 E	Elements mere guess-work	9 54.5	+21 45	3567
. . . .	. . . .	. . . .		10 5.5	—37 14	3633
. . . .	. . . .	. . . .	Period several months	6.2	—61 4	3637
. . . .		. . . .		18.7	+14 31	3712
86 Mar. 29	85 Dec. 11.73	+194.65 E †	Elements are Espin's, very uncertain. Sawyer's obsns. confirm variability but give no period	32.6	—12 52	3796
52 Oct. 23	53 Mar. 12.5	+305.4 E—0.075 E^2	Elements provisional; whether the marked deviations from uniform period are secular or not is uncertain	37.6	+69 18	3825
. . . .	. . . .	. . . .	Irregular	41.2	—59 10	3847
. . . .	73 March	+575 E	Elements very uncertain	46.8	—20 43	3881
. . . .	87 March?	+395 E ? †	Elements inferred by Parkhurst from his observations	48.3	+14 15	3890
. . . .	. . . .	. . . .	Schoenfeld finds, very uncertainly, period of 160d	10 55.6	—17 47	3934
. . . .	61 Jan. 3.0	+184.95 E+0.13 E^2		11 5.7	+ 6 0	3994
. . . .	. . . .	. . . .		33.3	+ 3 56	4160
. . . .	. . . .	. . . .		56.7	+ 9 38	4300
. . . .	83 Sept. 15	+362 E	Elements very uncertain	11 59.1	+19 21	4315
. . . .	75 Mar. 14	+337 E	" " "	12 9.5	— 5 28	4377
. . . .	77 Dec. 31	+317.2 E	Periodical inequality evident	14.5	—18 42	4407
84 February	84 May	+210 E	Elements very uncertain	28.7	— 3 52	4492
82 Apr. 30	82 Aug. 21.0	+257.2 E	Evidence of periodical irregularity	31.9	+60 3	4511
09 Mar. 11.17	09 May 29.17	+145.63 E+	+12d.5 sin(2°.5 E+135°) + 4 .5 sin(5 0 E+ 65) Elements provisional	33.4	+ 7 33	4521
. . . .	. . . .	0 21 20 †	Period is Gould's; min. precedes max. 9 hours	36.0	—68 51	4536
60 Feb. 4.0	60 May 21.4	+223.92 E+0.102 E^2	Signs of periodical irregularity	39.6	+61 39	4557
82 Feb. 13.0	82 May 12.0	+207.2 E		12 46.0	+ 6 6	4596
69 Apr. 17.466	69 Apr. 25.666	+ 17.27263 E *		13 20.9	— 2 52	4805
. . . .	67 Sept. 4	+251 E *		22.6	— 2 39	4816
. . . .	1764 Dec. 22.5	+496.91 E—0.2307 E^2	—0d.001276 E^3 +80d.5 sin(4°.3 E+353°.7) Gould has an entirely different law	24.2	—22 46	4826
63 Feb. 9	63 May 17.0	+376.0 E	Schoenfeld favors assumption of secular shortening of period; my results show rather periodical irregularity	27.8	— 6 41	4847
. . . .	. . . .	. . . .		44.6	+40 2	4948
. . . .	86 June	+383 E †	Elements inferred by Parkhurst from his observations	13 59.6	— 8 43	5037
. . . .	80 May 25.4	+302.6 E	Elements represent Markree observation in 1855	14 5.0	—12 50	5070
. . . .		. . . .	Period probably long and irregular	9.4	—59 27	5095
. . . .	. . . .	. . . .	Only one appearance known	9.4	+19 32	5097
82 Aug. 15	82 Nov. 7	+123 E		19.4	+16 46	5156
80 Jan. 14	80 June 9.0	+272.3 E		19.5	+54 16	5157
85 Jan. 29	84 Sept. 3	+266.5 E †	Duner's elements	25.7	+39 18	5194
. . . .	82 Dec. 10	+269.5 E		25.1	+84 17	5190
80 Mar. 13	80 June 23.0	+223.9 E		32.8	+27 10	5237
. . . .	. . . .	. . . .		14 34.8	—17 14	5249

No.	Sch.	Star	1855.0 R.A.	1855.0 Decl.	Annual Variation		Discoverer	Date	Red-ness	Magnitude Max.	Magnitude Min.
			h m s	° ′	s	′					
5274		W Bootis	14 37 3	+27 8.9	+2.64	—0.26	Schmidt	1867		5.2	6.1
5338		U Bootis	47 37	+18 17.1	2.78	0.25	Baxendell	1880	2.7	9.1– 9.3	12–13.6
5374	74	δ Librae	14 53 14	— 7 56.4	3.20	0.24	Schmidt	1859	(1)	5.0	6.2
5430		T Librae	15 2 28	—19 27.8	3.41	0.23	Palisa	1878		10.2	<14
5438		Y Librae	4 2	— 5 27.6	3.16	0.23	Bauschinger	1887		8½	?
5465		R Triang. austr.	6 52	—65 57.5	5.25	0.23	Gould	1871		6.6	8.0
5484	75	U Coronae	12 17	+32 10.8	2.45	0.22	Winnecke	1869	0.0	7.5	8.9
5494	76	S Librae	13 4	—19 51.7	3.43	0.22	Borrelly	1872	3.0	8.0– 8.3	<13
5501	77	S Serpentis	14 52	+14 50.3	2.81	0.22	Harding	1828	4.1	7.6– 8.7	12.5? *
5504	78	S Coronae	15 29	+31 53.5	2.44	0.22	Hencke	1860	4.9	6.1– 7.8*	11.9–12.5*
5583		X Librae	27 50	—20 40.8	3.47	0.21	Peters	1878		11?	<14
5593		W Librae	29 40	—15 41.5	3.37	0.20	Peters	1878		11?	<14
5617		U Librae	33 37	—20 42.6	3.48	0.20	Peters	1878	3.4	9	<14
5667	79	R Coronae	42 36	+28 36.3	2.47	0.19	Pigott	1795	0.5	5.8 *	13.0 *
5677	80	R Serpentis	44 1	+15 34.6	2.76	0.19	Harding	1826	3.7	5.6– 7.6*	13
5682		R Lupi	44 5	—35 51.6	3.87	0.19	Gould	1884		9	<11
5675		V Coronae	44 21	+40 0.7	2.14	0.19	Dunér	1878	5.9	7.2– 7.7	10.3–12.0
5688	81	R Librae	45 24	—15 48.1	3.39	0.18	Pogson	1858	(2)	9.2–10.0*	<13 *
5732	82	T Coronae	53 26	+26 20.1	2.51	0.18	Birmingham	1866	(1)	2.0 *	9.5 *
5770	83	R Herculis	15 59 43	+18 45.9	2.68	0.17	At Bonn	1855	2.0	8.0– 9.2	<13 *
5776		X Scorpii	16 0 2	—21 8.3	3.52	0.17	Peters	1876		>11	<13
5795		W Scorpii	3 18	—19 45.3	3.49	0.16	J. Palisa	1877		10–11.2	14.5
5826	84	T Scorpii	8 25	—22 36.7	3.56	0.16	Auwers	1860		7.0 *	<12
5830	85	R Scorpii	9 1	—22 35.0	3.56	0.16	Chacornac	1853	0.9	9.4–10.5	<13
5831	86	S Scorpii	9 2	—22 32.0	3.56	0.16	Chacornac	1854	(0)	9.1–10.5*	<13
5856		W Ophiuchi	13 36	— 7 21.3	3.23	0.15	Schönfeld	1881	3.0	8.9– 9.5	<13.5
5860	87	U Scorpii	14 7	—17 32.3	3.44	0.15	Pogson	1863		9? *	<12 *
5887		V Ophiuchi	18 40	—12 5.5	3.33	0.14	Dunér	1881	6.6	7.0	9.6–10.5
5889	88	U Herculis	19 23	+19 13.6	2.65	0.14	Hencke	1860	6.5	6.6– 7.8	11.4–12.7
5912	89	g Herculis	23 53	+42 12.2	1.97	0.13	Baxendell	1857	(3)	4.7– 5.5	5.4– 6.0
5928	90	T Ophiuchi	25 27	—15 49.2	3.42	0.13	Pogson	1860		10 *	<12.5 *
5931	91	S Ophiuchi	25 55	—16 51.1	3.44	0.13	Pogson	1854	(1)	8.3– 9.0*	<13
5950		W Herculis	30 5	+37 38.1	+2.12	0.13	Dunér	1880	3.2	8.0– 8.4	11.5–14
5948		R Ursae min.	31 57	+72 34.4	—0.88	0.13	Pickering	1881	3.2	8.6– 9.0	10.5
5955		R Draconis	32 17	+67 3.5	+0.14	0.12	Geelmuyden	1876	2.0	6.5– 8.7	13
6044	92	S Herculis	45 18	+15 11.4	2.73	0.11	At Bonn	1856	5.6	5.9– 7.5	11.5–13
6083	93	Ophiuchi	51 23	—12 40.0	3.36	0.10	Hind	1848	(5)	5.5 *	12.5 *
6088		V Herculis	52 58	+35 17.4	2.17	0.10	Baxendell	1880	1.0	9.5	11.7
6132	94	R Ophiuchi	16 59 27	—15 53.7	3.44	0.09	Pogson	1853	4.5	7.0– 8.1	<12 *
6181	95	α Herculis	17 8 2	+14 33.5	2.73	0.07	W. Herschel	1795	(5)	3.1 *	3.9 *
6189		U Ophiuchi	9 11	+ 1 22.6	3.04	0.07	{Gould Sawyer}	{1871 1881}	(0)	6.0	6.7
6202	96	u Herculis	11 58	+33 15.5	2.21	0.07	Schmidt	1869?	(4)	4.6 *	5.4 *
6268	97	Serpentarii	21 57	—21 21.2	3.59	0.06	Fabricius	1604		>1 *	? *
6368	98	X Sagittarii	38 26	—27 46.2	3.77	0.03	Schmidt	1866	(1)	4 *	6 *
6472	99	W Sagittarii	17 55 45	—29 34.9	3.83	—0.01	Schmidt	1866	(1)	5 *	6.5 *
6512	100	T Herculis	18 3 37	+30 59.9	2.27	+0.01	At Bonn	1857	1.4	6.9– 8.5	9.8–12.7
6573		Y Sagittarii	12 51	—18 55.2	3.53	0.02	Sawyer	1886	(0)	5.8	6.6
6624	101	T Serpentis	21 44	+ 6 12.5	2.93	0.03	Baxendell	1860	2.0	9.1–10.5	<13.5
6633	102	V Sagittarii	22 54	—18 21.5	3.51	0.03	Quirling	1865	0.6	7.6	8.8
6636	103	U Sagittarii	23 21	—19 13.3	3.53	0.03	Schmidt	1866	3.7	7.0 *	8.3 *
6682		X Ophiuchi	31 26	+ 8 42.3	2.87	0.05	Espin	1886	(5)	6.8	9?
6726	104	T Aquilae	38 47	+ 8 35.7	2.88	0.06	Winnecke	1860	3.3	8.8 *	10.0
6733	105	R Scuti	39 45	— 5 51.4	3.21	0.06	Pigott	1795	(4)	4.7– 5.7*	6.0– 9.0
6760		κ Pavonis	41 58	—67 24.4	6.23	0.06	Thome	1872		4.0	5.5
6758	106	β Lyrae	44 44	+33 11.8	2.21	0.06	Goodricke	1784	(1)	3.4 *	4.5 *
6794	107	R Lyrae	18 50 55	+43 45.5	+1.83	+0.08	Baxendell	1856	(4)	4.0	4.7

Greenwich Mean Time Min.	Max.	Period, etc.		Remarks	1900.0 R.A.	Decl.	No.
d h m	d h m	d h m s			h m	° ′	
...	...	...		Period long and irregular. Variability confirmed by Schwab	14 39.0	+26 57	5274
...	80 Mar. 25.5	+173.8 E			49.7	+18 6	5338
67 Oct. 25 9 17.5	...	+ 2 7 51 22.8 E		Algol-type	14 55.6	— 8 7	5374
...	78 May 30	+723 E			15 5.0	—19 38	5430
...	...	...			6.4	— 5 38	5438
71 July 12 16	71 July 14 15	+ 3 9 35 E	†	Period is Gould's. Epochs of max. and min. inferred from Cordoba observations	10.8	—66 8	5465
88 Jan. 0 13 8	...	+ 3 10 51 8.6 E		Algol-type	14.1	+32 1	5484
79 Dec. 23	80 Apr. 1	+192.3 E			15.6	—20 2	5494
...	28 Apr. 2.5	+365.25 E		+55d sin (5° E+30°)	17.0	+14 40	5501
82 Jan. 16	82 May 16.8	+360.57 E			17.3	+31 44	5504
...	...	...		Parkhurst confirms variability	30.4	—20 50	5583
...	...	...		" " "	32.2	—15 51	5593
...	...	...		My observations confirm variability, but give no times of maxima	36.2	—20 52	5617
...	...	...		Irregular	44.4	+28 28	5667
...	27 May 2.0	+357.6 E		+45d sin (5° E+15°)	46.1	+15 26	5677
...	...	...			47.0	—36 0	5682
...	78 Oct. 13.3	+359.5 E			46.0	+39 52	5675
...	58 Apr. 6	+730 E		Elements very uncertain	47.9	—15 56	5688
...	...	...		Nova	15 55.3	+26 12	5732
...	65 July 18.0	+318.4 E		+20d sin (12° E+324°)	16 1.7	+18 38	5770
...	...	...		Parkhurst thinks the changes are irregular.	2.7	—21 16	5776
...	76 May 18	+224.3 E			5.9	—19 52	5795
...	...	...		Nova in cluster Messier 80	11.1	—22 44	5826
...	82 Apr. 14.0	+224.5 E		There is strong evidence of marked inequality of short term, in the period	11.7	—22 42	5830
...	79 Dec. 28.0	+176.7 E			11.7	—22 39	5831
...	81 July 18	+323.6 E		Period 328d.8 will also represent Bessel's observation	16.0	— 7 28	5856
...	...	...		Only one appearance known	16.7	—17 39	5860
...	74 Apr. 30	+307 E		Older data conflict with elements derived from observations 1860 to 1885. Hence period is perhaps not uniform	21.2	—12 12	5887
81 Sept. 9	82 Mar. 3.0	+410.5 E			21.4	+19 7	5889
...	...	...		Irregular; limits of variation from Sawyer's observations	25.4	+42 6	5912
...	70 Feb. 23	+361 E		Very rude approximation to the elements	28.0	—15 55	5928
...	65 Mar. 4.4	+233.8 E	*		28.5	—16 57	5931
...	79 June 12	+288.7 E			31.7	+37 32	5950
81 May 23	81 July 15	+180 E?		Safarik has period of 337d. Possibly star has secondary fluctuations, and irregular period.	31.3	+72 29	5948
...	58 June 5.0	+245.9 E		Elements represent Lalande's and the DM. observations	32.4	+66 58	5955
56 Mar. 27	56 Sept. 1	+309.0 E		+55d sin (7°.5 E+100°) Elements provisional	47.3	+15 6	6044
...	...	...		Nova	53.9	—12 45	6083
...	83 Nov. 5	+ {257.5 / 324.0} E		Additional observations only can distinguish which is the correct period	16 54.6	+35 13	6088
...	65 Oct. 21.7	+302.4 E	*		17 2.0	—15 58	6132
...	...	...		Irregular. Period two or three months with wide fluctuations from the mean	10.1	+14 30	6181
81 July 17 15 33.52	...	+ 0 20 7 41.6 E— 40 ?		—0s.0002 E². Algol-type	11.5	+ 1 19	6189
...	...			Period subject to many anomalies. Very rapid secondary oscillations near minimum remarked by Schmidt, confirmed by Schwab	13.6	+33 12	6202
...	...	...		Nova	24.6	—21 24	6268
83 July 8.867	83 July 11.743	+ 7.01185 E	*	My investigation gives merely nominal corrections to Schoenfeld's elements, which are therefore retained	41.3	—27 48	6368
83 Aug. 12.268	83 Aug. 15.425	+ 7.59445 E			17 58.6	—29 35	6472
67 Dec. 22.3	68 Mar. 9.3	+164.75 E		+5d sin (7°.2 E+57°.6)	18 5.3	+31 0	6512
86 Sept. 23.51	86 Sept. 25.31	+ 5.7690 E			15.5	—18 54	6573
...	67 Dec. 2.1	+342.3 E	*		23.9	+ 6 14	6624
...	...	...		Irregular	25.5	—18 20	6633
83 Aug. 14.658	83 Aug. 17.624	+ 6.74493 E			26.0	—19 12	6636
...	...	...			33.6	+ 8 45	6682
...	...	...		Period three to five months, and irregular	41.0	+ 8 38	6726
86 July 18	86 Aug. 22	+ 71.1 E		Argelander's period with provisional epochs determined from observations 1885–87	42.1	— 5 49	6733
71 Nov. 29.8	71 Dec. 3.8	+ 9.097 E			46.6	—67 21	6760
55 Jan. 6 14 28.7	...	+12 21 46 58.3+	†	+0s.4217 E² —0s.00007 E³ W. M. Reed's elements Secondary minimum about midway	46.4	+33 15	6758
87 Oct. 1	87 Oct. 16	+ 46.0 E		Schoenfeld's period with epochs found from Sawyer's 1887 observations	18 52.3	+43 49	6794

No.	Sch.	Star	1855.0 R.A.	1855.0 Decl.	Annual Variation		Discoverer	Date	Redness	Magnitude Max.	Magnitude Min.
			h m s	° ′	s	′					
6806	108	S Coronae austr.	18 51 22	—37 8.6	+4.06	+0.08	Schmidt	1866		<9.5	13.0
6811	109	R Coronae austr.	52 8	—37 8.8	4.06	0.08	Schmidt	1866		9.8–11.5	13.2
6812		T Coronae austr.	52 12	—37 9.	4.06	0.08	Schmidt	1876		<9.8	13
6849	110	R Aquilae	18 59 23	+ 8 0.8	2.89	0.09	At Bonn	1856	5.5	6.4– 7.4*	10.9–11.5
6903	111	T Sagittarii	19 7 52	—17 13.2	3.46	0.10	Pogson	1863	6.5	7.6– 8.1*	<11 *
6905	112	R Sagittarii	8 11	—19 33.5	3.52	0.10	Pogson	1858	3.6	7.0– 7.2*	<12 *
6921	113	S Sagittarii	10 57	—19 17.1	3.51	0.10	Pogson	1860	(0)	9.7–10.4*	<13
6984		U Aquilae	21 33	— 7 20.3	3.23	0.12	Sawyer	1886	(0)	6.3	7.3
7045	114	R Cygni	32 56	+49 52.5	1.61	0.13	Pogson	1852	6.0	5.9– 8.0*	<13
7101	115	11 Vulpeculae	41 37	+26 57.7	2.46	0.14	Anthelm	1670		3 *	? *
7106	116	S Vulpeculae	42 27	+26 55.7	2.46	0.15	{Hind Baxendell}	{1861 1862}	3.0	8.4– 8.9*	9.0– 10.0
7120	117	χ Cygni	45 0	+32 33.0	2.31	0.15	Kirch	1686	6.3	4.0– 6.5	13.5
7124	118	η Aquilae	45 5	+ 0 38.2	3.06	0.15	Pigott	1784	(2)	3.5 *	4.7 *
7149		S Sagittae	49 25	+16 15.4	2.73	0.15	Gore	1885	(0)	5.6	6.4
7192		Z Cygni	19 57 21	+49 38.4	1.70	0.16	Espin	1887	(7)	7?	14?
7220	119	S Cygni	20 2 28	+57 34.2	1.26	0.17	At Bonn	1860	5.1	8.8–11.3	<13 *
7234	120	R Capricorni	3 10	—14 41.6	3.37	0.17	Hind	1848	(4)	8.8– 9.7*	<13 *
7242	121	S Aquilae	4 57	+15 11.5	2.76	0.17	Baxendell	1863	0.8	8.4–10.1	10.7–11.8 *
7252		W Capricorni	5 57	—22 24.9	3.54	0.17	Peters	1872?		11?	14?
7257	122	R Sagittae	7 27	+16 17.4	2.74	0.18	Baxendell	1859	0.8	8.5– 8.7*	9.8–10.4*
7261	123	R Delphini	7 55	+ 8 39.1	2.90	0.18	{Heneke Schoenfeld}	{1851 1859}	4.0	7.6– 9.0	11.1–12.8
7285	124	P Cygni	12 27	+37 35.1	2.21	0.18	Jansen	1600	(2)	3– 5 *	<6 *
7299	125	U Cygni	15 7	+47 26.3	+1.86	0.19	Knott	1871	9.3	7.0– 8.1	9.4–11.6
7194	126	R Cephei	34 37	+88 41.0	—42	0.21	Pogson	1856	0.5	5? *	10? *
7431	127	S Delphini	36 24	+16 34.2	+2.76	0.21	Baxendell	1860	6.0	8.4– 9.0	10.4–12.0
7428		V Cygni	36 38	+47 37.5	1.94	0.21	Birmingham	1881	8.3	6.8– 9.5	13.5
7437		X Cygni	37 44	+35 4.0	2.35	0.21	Chandler	1886	(0)	6.4	7.2– 7.7
7444	128	T Delphini	38 38	+15 52.5	2.78	0.21	Baxendell	1863	2.0	8.2–10.3	<13 *
7455	129	U Capricorni	40 4	—15 18.8	3.35	0.22	Pogson	1858		10.2–10.8*	<13 *
7456		RR Cygni	41 3	+44 20.4	2.08	0.22	Espin	1888	(6)	8?	9.5?
7459	130	T Cygni	41 24	+33 50.6	2.39	0.22	Schmidt	1864	(1)	5.5? *	6? *
7468	131	T Aquarii	42 17	— 5 40.9	3.17	0.22	Goldschmidt	1861	1.2	6.7– 7.8	12.4–13.0
7483		T Vulpeculae	45 19	+27 42.3	2.54	0.22	Sawyer	1885	(0)	5.5	6.5
7488		Y Cygni	46 16	+34 7.0	2.39	0.22	Chandler	1886	(0)	7.1	7.9
7560	132	R Vulpeculae	57 56	+23 14.9	2.66	0.23	At Bonn	1858	2.0	7.5–8.5 *	12.5–13.6
7571		V Capricorni	20 59 9	—24 30.2	3.50	0.24	Peters	1867		9.5?	14?
7577		X Capricorni	21 0 15	—21 55.8	3.45	0.24	Peters	1872?		11.5?	<14
7609		T Cephei	7 33	+67 54.4	0.82	0.24	Ceraski	1878	6.3	5.6– 6.8	9.5– 9.9
7659	133	T Capricorni	14 0	—15 46.4	3 32	0.25	Hind	1854	(2)	8.9– 9.7*	<13 *
7754		W Cygni	30 34	+44 43.7	2.27	0.27	Gore	1885	(5)	6.1– 6.3	6.7
7787		Cygni	36 1	+42 11.0	+2.36	0.27	Schmidt	1876	(3)	3	13.5
7779	134	S Cephei	36 57	+77 58.2	—0.60	0.27	Hencke	1858	9.1	7.4– 8.5*	11.5 *
7803	135	μ Cephei	39 4	+58 7.0	+1.83	0.27	{Hind Argelander}	1848	6.2	4? *	5? *
7907		U Aquarii	21 55 24	—17 19.5	3.29	0.29	Peters	1881		10?	14?
7944	136	T Pegasi	22 1 49	+11 49.9	2.93	0.29	Hind	1863	(3)	8.5– 9.3	<13
7994		R Piscis austr.	9 45	—30 19.6	3.43	0.30	Gould	1884		5.7?	<11?
8073	137	δ Cephei	23 48	+57 40.4	2.21	0.31	Goodricke	1784	(2)	3.7 *	4.9 *
8093		R Indi	25 36	—68 2.1	4.40	0.31	Gould	1884		9?	11?
8153		R Lacertae	36 50	+41 36.8	2.65	0.31	Deichmüller	1883	1.8	8.6– 9.3	<13.5
8230	138	S Aquarii	49 20	—21 7.0	3.23	0.32	Argelander	1853	4.0	7.7– 9.1*	<12.5
8273	139	β Pegasi	56 45	+27 17.8	2.90	0.32	Schmidt	1847	(2)	2.2 *	2.7 *
8290	140	R Pegasi	22 59 22	+ 9 45.7	3.01	0.32	Hind	1848	(4)	6.9– 7.9	<13
8373	141	S Pegasi	23 13 13	+ 8 7.6	3.03	0.33	Marth	1864?	1.7	7.3– 8.0	<13
8512	142	R Aquarii	36 19	—16 5.3	3.11	0.33	Harding	1811	4.3	5.8– 8.5*	11? *
8588		R Phoenicis	48 55	—50 35.6	3.14	0.33	Gould	1884		8½?	11?
8597		V Ceti	50 29	— 9 46.1	3.08	0.33	Peters	1879		9.7?	14?
8600	143	R Cassiopeae	23 51 4	+50 34.9	+3.01	+0.33	Pogson	1853	6.5	4.8– 7.0	9.8– 12

Greenwich Mean Time Min.	Max.	Period, etc.		Remarks.	1900.0 R.A.	Decl.	No.
d h m	d h m	d h m s			h m	° ′	
...	...	6 ?		Schmidt formerly thought period is six days; but his observations since 1881 throw doubt on periodicity	18 54.4	—37 5	6806
...	...	30.5 ?		In west end of a small nebula	55.2	—37 5	6811
...	...	...		4s foll. R Coronae austr.	55.3	—37 5	6812
56 Mar. 23	56 Aug. 7	+352.3 E —0.4 E²		Elements provisional, but rapid shortening of period pretty certain	19 1.5	+ 8 5	6849
...	83 July 7	+384 E			10.5	—17 9	6903
...	69 June 28	+270 E	*		10.8	—19 29	6905
...	69 Nov. 20	+230 E	*		13.6	—19 13	6921
86 Sept. 17.5	86 Sept. 20.0	+ 7.033 E			24.0	— 7 15	6984
...	81 Aug. 7	+425.7 E			34.1	+49 58	7045
...	...	...		Nova	43.5	+27 4	7101
85 Apr. 7.5	85 Apr. 27.8	+ 67.80 E	†	Elements of J. Baxendell, Jr.	44.3	+27 2	7106
...	1763 May 26.76	+406.045 E		+0d.00574 E² +0d.0000173 E³ Elements provisional.	46.7	+32 40	7120
88 Jan. 4 3 32	88 Jan. 6 12 32	+ 7 4 14 0.0 E		Elements adopted are a correction of +1h 43m of Argelander's epoch 400, and of —4s of his period	47.4	+ 0 45	7124
85 Dec. 1 9 36	85 Dec. 4 9 36	+ 8 9 11.0 E			51.4	+16 22	7149
...	...	...			19 58.6	+49 46	7192
...	65 July 9.2	+323.3 E —0.067 E²			20 3.4	+57 42	7220
...	64 Sept. 3	+347 E	*		5.7	—14 34	7234
70 Jan. 29.2	...	+146.71 E	*		7.0	+15 19	7242
...	85 Sept.	+425 E?	†	Elements from Parkhurst's observations; very uncertain	8.6	—22 17	7252
73 May 1.03	...	+ 70.43 E	*	Type of Beta Lyrae. Secondary minimum follows principal one 34d.9. Evidence of systematic but small deviations from uniform period	9.5	+16 25	7257
...	69 July 13.6	+284.0 E	*		10.5	+ 8 47	7261
...	...	...		Nova	14.1	+37 43	7285
77 Feb. 21.5	77 Oct. 9.6	+461.3 E	†	Elements are Baxendell's	20 16.5	+47 35	7299
...	...	...		Schoenfeld thinks period somewhat less than a year; Schmidt's obsns. confirm; variations generally between 8.0 and 8.5.	19 58.9	+88 50	7194
73 May 10	73 Aug. 22	+277.0 E		Evidence of periodic inequality	20 38.5	+16 44	7431
...	81 June 1	+423 E?		A secondary maximum follows principal one, two or three months	38.1	+47 47	7428
86 Oct. 7 23 56	86 Oct. 13 14 20	+ 15 14 24 E		Bright and faint minima, but not regularly alternating	39.5	+35 13	7437
...	84 Sept. 10.0	+331.9 E		Large deviations from a mean period	40.7	+16 2	7444
...	72 Sept. 19	+203.5 E	*		42.6	—15 9	7455
...	...	...			42.6	+44 30	7456
...	...	...		Period about one year, but variations in some years scarcely noticeable	43.2	+34 0	7459
81 Feb. 15.5	81 May 10.5	+203.3 E			44.7	— 5 31	7468
85 Nov. 1 19 8.6	85 Nov. 2 20 35.0	+ 4 10 29.0 E			47.2	+27 52	7483
88 July 15 19 8	...	+ 1 11 56 48		Algol-type. Large anomalies in period	48.0	+34 17	7488
65 July 19.0	65 Sept. 20.0	+136.9 E+		20d sin (4° E+90°) Schoenfeld had a term —0.06 E², but later observations do not confirm it	20 59.9	+23 25	7560
...	86 Sept.	+310 E?	†	Elements from Parkhurst's observations, but uncertain	21 1.8	—24 19	7571
...	85 Sept.	+210 E?	†	" " " " " "	2.8	—21 45	7577
73 Feb. 6	73 Aug. 23	+383.2 E			8.2	+68 5	7609
...	66 Nov. 13.2	+269.4 E	*		16.5	—15 35	7659
84 Oct. 12	84 Dec. 13	+126 E			32.3	+44 56	7754
...	...	...		Nova	37.8	+42 23	7787
80 Sept. 16	81 May 16	+484 E			36.5	+78 10	7779
...	...	+432?		Argelander's period from his observations 1848–64; but those of Schmidt since 1866 do not confirm it	40.4	+58 19	7803
...	...	...		Parkhurst's observations confirm variability, but give no maximum	21 57.9	—17 16	7907
...	69 Nov. 14	+373 E		There is apparently a large periodical inequality of short term	22 4.0	+12 3	7944
...	...	...			12.3	—30 6	7994
88 Jan. 0 15 57.0	88 Jan. 2 6 32.5	+ 5 8 47 39.974	†	Argelander's elements	25.4	+57 54	8073
...	...	...			28.9	—67 48	8093
...	83 Dec. 14	+315 E		Elements very uncertain	38.8	+41 51	8153
...	67 Aug. 11	+279.3 E			51.7	—20 53	8230
...	...	...		Period of one or two months, but the star's light is often nearly constant for many months	22 58.9	+27 32	8273
...	50 Dec. 6	+378.1 E +0d.17 E²			23 1.6	+10 0	8290
...	77 Dec. 19	+317.5 E			15.5	+ 8 22	8373
...	11 Nov. 30.6	+387.16 E+		35d sin (10° E+235°)	38.6	—15 50	8512
...	...	...			51.3	—50 21	8588
...	86 Sept.	+273 E?	†	Elements from Parkhurst's observations, and uncertain	52.8	— 9 31	8597
54 Feb. 10 ?	54 July 9.5	+429.0 E+		23d sin(16° E+346°)	2353.3	+50 50	8600

(*Continued from page 3.*)

one-tenth of the right-ascension, expressed in time-seconds, for the equinox 1900.0. The precept need not be rigorously applied where two or more variables occur within a few seconds of right-ascension, as it would be better to deviate from the strict order by one or two units than to disturb numbers already affixed.

The numbers of this catalogue have been taken in accordance with these principles; and it is respectfully submitted to the judgement of astronomers whether the system deserves general adoption.

The selection of the stars to be included in the catalogue has been a delicate task, whose difficulty can only be appreciated by those who are familiar with the confusion which so easily creeps into this branch of astronomy, and who have had occasion to undertake the discouraging and thankless labor of bringing order out of the chaos, by the careful and continuous observation necessary to discriminate the actual cases of variability from the numerous pseudo-variables with which the periodicals of the day are filled.

Considering it extremely desirable that no star should be placed in the list, no matter how high the authority on which its variability is asserted, without independent verification, I have had under observation a large number of stars during the last few years with this especial object in view. Mr. Sawyer, also, has similarly followed an extensive list, generally of the brighter class; and I have had the inestimable advantage of access to his results, and of consultation with him as to the propriety of the insertion of many of these stars. Another class of variables, mainly those discovered by Dr. Peters, which I found considerable difficulty in keeping track of with insufficient optical means, has been assiduously and effectively observed by Mr. H. M. Parkhurst, and his series of observations has been the main reliance for the attestation of the variability of these faint stars. Without the cordial collaboration of these gentlemen the present work would have been much less complete.

Two remarks remain as to the selection of the stars. First, all stars of Schönfeld's catalogue have been retained, although there appears to be perhaps a slight ground for doubt as to one or two of them. Thus, for instance, I have never been able to detect any trace of fluctuation in *δ Orionis*, and I believe Sawyer has a similar experience. But its rejection cannot be justified on this ground alone, in the face of high authority in favor of the variability. Secondly, as to the additions, I have had in mind as a paramount object that our knowledge must be kept clear of confusion, even at the risk of an incomplete statement of it; and that the omission of a star actually variable is not as injurious an imperfection in the catalogue as the insertion of one which is not so. Therefore, where a reasonable doubt has appeared to exist as to any star, it has been excluded until it could be further examined. A list of some of these cases is given below, with a succinct statement of the reasons for their omission.

NOTES RELATING TO STARS NOT INSERTED IN THE CATALOGUE.

Positions for Equinox 1855.0.

$1^h\,18^m\,31^s \quad -4°\,40'.9$

Gould thinks certainly variable. Sawyer's observations show no trace of fluctuation; his numerous estimates, ranging over a long period, all lie between 6.5 and 6.8.

$1^h\,27^m\,11^s \quad +11°\,48'.6$

In Borrelly's list, *Bull. Astron.* II. Gore thought near maximum 1885 Nov. 30, but observed only slight variability in 1886. Sawyer thinks it is not variable.

$1^h\,33^m\,0^s \quad -7°\,21'.6$

Safarik thinks variable from 8.4 to 9.2, from his observations 1887 Oct. to 1888 Feb. 19; period probably longer than four months.

$3^h\,41^m\,9^s \quad +35°\,16'.7$

Kam suspects variability; see *A.N.* CX, 181. By my observations 1888 April 2, and Aug. 11, it must have been below 11.5 or 12.0.

$3^h\,45^m\,26^s \quad +7°\,20'.6$

Gould thought certainly variable, from 6.8 to 8.0. My observations seem to favor fluctuation, but I desire to continue them before pronouncing definitely.

$4^h\,48^m\,48^s \quad -16°\,39'.3$

Gould's *R Eridani.* Sawyer's observations do not show any change of light.

$4^h\,53^m\,11^s \quad -12°\,45'.1$

Gould's *S Eridani.* Sawyer's observations do not show any change of light.

$5^h\,21^m\,48^s \quad -4°\,49'.1$

Safarik thinks variable by several magnitudes. Near *S Orionis*. See *V.J.S.* 1884, p. 145.

$5^h\,22^m\,22^s \quad -1°\,11'.7$

Gould says it appears to be variable from $4\frac{3}{4}$ to 6. The star is very red. Gore thinks his observations confirm variability.

$5^h\,27^m\,10^s \quad +10°\,8'.1$

Gould thinks variable, from discordance of Cordoba estimates, 5.7 to 6.7. Other observations do not appear to confirm.

$6^h\,12^m\,54^s \quad +47°\,43'.5$

Espin suggests variability. Not yet confirmed.

7ʰ 21ᵐ 3ˢ —11° 15′.9

ESPIN asserts variability and assigns a period of fourteen days; in which he is confirmed by JACKSON. But SAWYER, YENDELL and myself have carefully followed it without detecting the slightest change. I consider the constancy of its light practically demonstrated.

7ʰ 35ᵐ 15ˢ —31° 19′.6

GOULD's *R Puppis*. Neither SAWYER's observations nor mine show any unsteadiness of lustre.

7ʰ 43ᵐ 11ˢ —40° 17′.5

GOULD's *T Puppis*. SAWYER has followed the star as closely as the low altitude of the star in this latitude will permit, and has yet found no confirmation.

8ʰ 1ᵐ 34ˢ +19° 50′.0

PETERS announced as variable, *A.N.* CII, 147. My observations do not confirm, but are indecisive. PARKHURST thinks that, if variable, it may possibly be of *Algol*-type, but the evidence of change by his observations is also slight.

10ʰ 0ᵐ 42ˢ —51° 29′.0

GOULD's *R Velorum*. As he gives no period, and there are no other confirmatory observations, I have considered it safer not to insert it in the catalogue.

10ᵈ 49ᵐ 30ˢ —59° 44′.8

GOULD's *T Carinae*. UPTON's comparisons in 1883 seem to confirm, but the observed limits of variation are so small that I think more evidence is essential before classing it with the known variables.

12ʰ 26ᵐ 47ˢ —22° 35′.7

β Corvi. SAWYER's observations seem to show clearly the variation of this star, but he agrees with me that it is better to await confirmation before inserting in the catalogue. See *A.N.* CXI, 271.

13ʰ 26ᵐ 58ˢ —12° 28′.0

SCHMIDT thought variable, and GOULD that the Cordoba estimates confirmed it, and the latter suggested the name *Y Virginis*. SAWYER, however, has eight observations, in different years, all within the narrow range 6.0 to 6.25; and he is very skeptical as to its variability. The star is very difficult to observe, which may account for the discordances. See my note *H.C.O. Annals*, XIV, Part II, p. 456, star No. 2293.

14ʰ 56ᵐ 20ˢ —68° 9.4

GOULD's *T Triang. austr.* He says it is variable between 7.0 and 7.4, in a period which differs but little from a mean solar day. The assigned limits are so narrow that confirmation by other observations is desirable, to justify its insertion in the catalogue.

15ʰ 35ᵐ 17ˢ —10° 27′.7

WEISS says it is variable from 7.0 to 8.8, in a period of about four months. My observations yet do not enable me to confirm the variation certainly.

15ʰ 37ᵐ 55ˢ —20° 40′.8

PETERS announced the variability, *A.N.* CII, 147. My observations furnish no decisive evidence in the matter.

16ʰ 20ᵐ 47ˢ —19° 11′.5

PETERS announced the variability, *A.N.* XCIX, 120. My observations indecisive. PARKHURST says he has never been able to see this star, and he mentions it, in a private letter, as one of the three stars of PETERS which he has not yet been able to confirm.

18ʰ 1ᵐ 54ˢ +28° 44′.4

o Herculis. See my note, *H.C.O. Annals*, XIV, Part II, p. 464, No. 3048.

19ʰ 9ᵐ 53ˢ —19° 19′.4

SAFARIK thinks his observations show variability between 9.4 and 10.1. Near *S Sagittarii*, with which he confounded it, when first undertaking to observe the latter.

19ʰ 15ᵐ 13ˢ +17° 23′.1

ESPIN's suggestion of variability is very likely correct, although my observations do not yet confirm it certainly.

19ʰ 26ᵐ 15ˢ +17° 26′.0

I have given the evidence which, it seems to me, render the variability almost certain, in the *Science Observer*, Nos. 43–44, Vol. IV. It lies 0ˢ.7 foll., north 2′.2, DM. +17.3997. I have looked for it at least fifty times unsuccessfully, when it must have been below 13.

19ʰ 27ᵐ 13ˢ —25° 2′.0

GOULD thinks variable between limits wider than 5.3 to 6.7. SAWYER has three observations in 1882, 1886 and 1887, giving accordantly 5.9 or 6.0.

19ʰ 55ᵐ 18ˢ +30° 25′.6

ESPIN suggests variability. Not yet confirmed.

20ʰ 5ᵐ 3ˢ +47° 25′.4

ESPIN alleges variability, 7.7 to 8.9. My estimates so far perfectly accordant, 8.9 or 9.1.

20ʰ 8ᵐ 7ˢ +38° 17′.4

ESPIN alleges variability, 6.6 to 8.0. My observations indicate that there is some possibility of change, but the star is close to another, and difficult to adjudge properly.

20ʰ 8ᵐ 37ˢ —21° 45′.6

SAFARIK thinks his observations show fluctuation of six-tenths of a magnitude. SECCHI had previously marked it "var.?" in his *Prodromo*.

20ʰ 23ᵐ 34ˢ +39° 29′.9

ESPIN alleged variability, 7.9 to 9.2; afterwards, in 1886, found it practically invariable.

20ʰ 38ᵐ 50ˢ +17° 34′.0

D'ARREST suspected variability, and my observations in 1886 and 1888, lead me to believe it may possibly be subject to it. GORE asserts a period of perhaps 111 days.

21h 1m 37s +47° 3′.9

ESPIN alleges as variable from 4.7 to 6.0, in long or irregular period; but my observations, some of them nearly coincident in date with his, contradict them and give no support to the idea of fluctuation. SAWYER also thinks the star is constant. The star is very red, and difficult to observe; one of those likely to deceive an inexpert or uncritical observer.

22h 28m 17s —8° 20′.8

HIND suspected the variability, and SCHÖNFELD was inclined to think it not improbable. See *A.N.* LXIV, 176. Also *Nature*, XXX, 346. I am observing the star, but cannot yet say anything definite with regard to it.

23h 39m 0s +2° 40′.8

GOULD was inclined to suspect variability, and other evidence seems to accord with the idea. See my note *H.C.O. Annals*, XIV, Part II, p. 474, No. 4198. My observations in 1885 and 1886 do not confirm, and I am strongly of opinion that the red color is responsible for much, if not all, of the observed contradiction in the estimates, made under different circumstances.

23h 53m 54s +59° 33′.1

SECCHI marked this as "var.?" My own observations in 1875 led me independently to suspect it, at first, but I afterwards concluded that the trouble lay entirely in the difficulty of estimating properly this very red star so close to a bluish companion.

In assigning ARGELANDER'S letters the rubrics of SCHÖNFELD and WINNECKE have been observed. In *Virgo* and *Cygnus* the alphabet is exhausted, and the extension of the notation under the suggestion of HARTWIG, favored by SCHÖNFELD, is begun by designating No. 5037 of the catalogue as *RR Virginis*, and No. 7456 as *RR Cygni.*

SECOND CATALOGUE

OF

VARIABLE STARS.

S. C. CHANDLER.

FROM THE

ASTRONOMICAL JOURNAL.

No. 300.

SECOND CATALOGUE OF VARIABLE STARS,

By S. C. Chandler.

The unexpected delay in the appearance of this Catalogue has largely been due to the labor involved in carrying out the design of making the elements of every star definitive, in the sense that every observation available up to date should be included in the calculation. This design has been adhered to as faithfully as possible, and the elements here given may be regarded as a practically complete representation of our present knowledge. Even in the few cases, especially mentioned in the notes, where observations of maxima and minima have come to hand since the computation of the elements, they have been compared with the latter, in order to assure that the deviations are merely nominal.

While the general form of the First Catalogue has been retained, some changes have been made to increase its convenience in use, and to supply additional information of value to observers. The nature of these changes will be apparent in the following description of the construction.

Number. The number in the first column of both right and left-hand pages is assigned upon the system of ordinal notation introduced in the First Catalogue, by taking one-tenth of the right-ascension, expressed in time-seconds, for the equinox 1900.0. This precept has not been rigorously applied, nor in the future need be so applied, where two or more variables occur within a few seconds of right-ascension. Also, in the numbers for the newer stars, it has been thought best to violate the strict rule in a few cases, where the numbering would otherwise have been consecutive, in order to provide gaps for future variables. It is essential that numbers once assigned should not be disturbed, even at the expense of deviating by one or two units from the strict enumeration.

Star. The letters according to Argelander's system of nomenclature, extended by the use of double letters, require no special remark.

R.A. and Decl. for 1900.0. These are given to the nearest second and tenth of a minute, respectively. To secure strict accuracy in the last place, all the available meridian and micrometric determinations of position have been collected and reduced accurately to 1875.0, with precessions and secular variations calculated for this epoch. Any appreciable proper motions were then detected and assigned; and the mean places carried forward accurately to the equinox and epoch of 1900.0. For some of the newly discovered variables no precise places could be found, and for these it was necessary to employ the rude data given by the observers — often expressed merely to the tenth of a minute in R.A. and round minute in Declination. It is desirable to suggest that the use of such coarse units is insufficient for the purpose of certainly distinguishing these objects, in their fainter stages, from the small telescopic stars in their vicinity; and that those who are addicted to this habit should raise their standard of precision.

Annual Variations for 1900. Precessions *plus* proper motions for this date, to the nearest hundredth in seconds and minutes, respectively, in R.A. and Declination.

R.A. and Decl. for 1855.0. These are repeated from the First Catalogue, as a matter of general obvious convenience.

Redness. This is expressed in a numerical arbitrary scale, which may be approximately defined as follows: 0 corresponds to white; 1, to the slightest perceptible admixture of yellow with the white; 2, to yellow; 3, to yellowish orange; 4, to full orange or orange-red; 5-10, to increasing shades of intensity up to the deepest red of which we have cognizance in the heavens, exemplified nearly by such stars as 1771 *R Leporis*, 7428 *V Cygni*, 7779 *S Cephei* and 7803 *μ Cephei*. For a fuller description, with details of the determinations, reference is made to *A.J.* VIII, 137, and to the introduction to the First Catalogue. Mr. Yendell has furnished some estimates of stars not included in my determinations, conforming to the same scale; and these are indicated by an asterisk. Where a round unit merely is given, it signifies that it is not the result of direct estimate, made uniformly with the general series, but merely a rude attempt to assign a value from general knowledge, or description by other observers.

Maximum and Minimum Magnitude. These columns contain the previously observed extremes of brightness at each of these phases, derived from a comparative scrutiny of all the trustworthy data up to date, expressed in the prevailing scale of magnitude, namely, that of the *Uranometria Nova*,

the *Durchmusterung*, the *Uranometria Argentina* and the Southern *Durchmusterung*. For the fainter magnitudes, where our knowledge of absolute standards for the extension of ARGELANDER's scale downwards is vague, the scale used may be defined by the limits of visibility established by SCHÖNFELD for the Mannheim refactor, 12.7; by my 6¼-inch, 13.0; and by TOWNLEY for the Madison 15-inch, 14.7.

M — m. The interval in days and fractions thereof, from minimum to the next following maximum. In the First Catalogue this information was given by the calendar date. The present mode is chosen for economy of space, and is quite as convenient in computing times of minimum from the elements of maximum.

Elements of Maximum. These are uniformly in Greenwich mean time. The principal epoch is expressed in two ways; first, by the ordinary calendar date, without fractions of a day; next by the corresponding Julian date, with the fractions. For the 10 stars of the *Algol*-type, and for 2213 *η Geminorum* and 3186 *T Cancri*, the nature of the light-curves permits the minimum alone to be determined, and therefore the column contains for these stars, as well as for *β Lyrae*, the principal minimum-epoch.

The period is expressed in days and decimal fractions, except for some of the stars of short period, where hours, minutes and seconds are used, following custom, and convenience in writing the small inequalities which it would be awkward to express in decimals of a day.

The factor E is the number of periods elapsed since the principal epoch. The principal epoch is generally the first recorded maximum (or minimum) after discovery, in conformity with the practice of ARGELANDER and SCHÖNFELD. Wherever this rule is departed from, it is for the purpose of adhering to the enumeration already established in standard investigations of particular stars. Exceptional deviations from these rules are recorded in the notes.

Following the periods are the numerical inequalities depending on powers or periodic functions of E. In addition to the cases where these inequalities have been numerically determined, there are a large number of others where the existence of such terms has been discovered, but in which it is not yet practicable to determine the coefficients. These are indicated in the column of remarks by the words "periodic inequality," a query being affixed when the evidence is somewhat obscure.

The column of remarks also contains, for the non-periodic stars, a characterization of the type of variability. For want of a better concise phrase, the term "Irregularly periodic" is used for stars in which the periodicity is manifested in a slight degree. The term "Irregular" is used where there is an entire absence of any discernible law in the changes of brightness.

It is hardly necessary to say that the elements are the result of original investigation in all cases except where the authority is accredited in the remarks.

Basis of Elements. These columns contain the number of maxima, M, the number of minima, m, and the interval embraced by them, upon which the calculation of the elements depends. This information is of the utmost importance and usefulness to future observers of these objects, indicating the character of our present information, and guiding the selection of stars for observation. It should be noted that a very large proportion of the maxima and minima were determined by two or more observers, so that the actual number of observations of the phases used in the calculations is much larger than appears.

For convenience in computing ephemerides, and in comparing future observations with the elements of the Catalogue, a table is added for the conversions of Julian and Calendar dates during the next ten years.

TABLE FOR CONVERTING JULIAN AND CALENDAR DATES.

	1893	1894	1895	1896	1897	1898	1899	1900	1901	1902	1903
Jan. 1	241 2465	2830	3195	3560	3926	4291	4656	5021	5386	5751	6116
Feb. 1	2496	2861	3226	3591	3957	4322	4687	5052	5417	5782	6147
Mar. 1	2524	2889	3254	3620	3985	4350	4715	5080	5445	5810	6175
Apr. 1	2555	2920	3285	3651	4016	4381	4746	5111	5476	5841	6206
May 1	2585	2950	3315	3681	4046	4411	4776	5141	5506	5871	6236
June 1	2616	2981	3346	3712	4077	4442	4807	5172	5537	5902	6267
July 1	2646	3011	3376	3742	4107	4472	4837	5202	5567	5932	6297
Aug. 1	2677	3042	3407	3773	4138	4503	4868	5233	5598	5963	6328
Sept. 1	2708	3073	3438	3804	4169	4534	4899	5264	5629	5994	6359
Oct. 1	2738	3103	3468	3834	4199	4564	4929	5294	5659	6024	6389
Nov. 1	2765	3134	3499	3865	4230	4595	4960	5325	5690	6055	6420
Dec. 1	241 2799	3164	3529	3895	4260	4625	4990	5355	5720	6085	6450

In view of the profuse announcements of variability during the past few years, the very moderate increase in the present Catalogue over the previous one may excite surprise among those who do not know the facility with which rubbish collects about the subject. This Catalogue would be very much longer if all such announcements, made on what might be regarded as reputable authority, had been admitted. But it would have ceased thereby to represent

any exact knowledge. Among those who busy themselves with the subject there are some with whom the uncritical habits of the seventeenth century still prevail, and who emulate the exuberant enthusiasm of MONTANARI, who discovered more than a hundred new variables — only one of which is now in our lists — and who made no observations of any service whatever, as to the phenomena; rather than the critical and conscientious care of ARGELANDER, who first winnowed the chaff from the wheat, in his little catalogue of 18 stars published in 1844, and from that point elevated the subject into a science; or of SCHÖNFELD, who extended it and maintained its purity.

No apology therefore is needed for the unrelaxed application of the principles, for deciding the delicate and perplexing question as to what stars shall be admitted, which were set forth in the introduction to the First Catalogue. They may be summed up in two sentences. It is a paramount consideration that our knowledge must be kept clear of confusion, even at the risk of an incomplete statement of it. No star should be inserted, no matter how high the authority on which its variability is declared, without independent verification on undoubted authority and evidence. Otherwise the result will be chaos.

As a matter of fact then, the only stars added are those which have been sufficiently confirmed since the first edition. On the other hand, four stars which have long appeared in the older lists have been dropped, for reasons which will be stated in the notes to the supplementary list, to which they have been relegated; and there are perhaps two or three others which might be treated in the same way. During the past two years other investigations have prevented my giving the attention which I had previously given, to the observation of the long list of objects awaiting confirmation; but Mr. YENDELL has taken the matter into efficient charge, and has kept more than a hundred of them on his working list. It is to his discrimination and zeal that many of the confirmations are due, as will be seen in the notes to the catalogue. He has kindly kept me supplied with the evidence on this matter afforded by his observations. I am also deeply indebted to Mr. PARKHURST and Mr. YENDELL for the results of their very numerous observations, in advance of publication, of maxima and minima of known variables. During the last few months I have been in continual correspondence with these gentlemen, and to them is almost entirely due the completeness with which the present work has been brought up to date. Without their cordial collaboration and interest, indeed, it would have been extremely imperfect. Profound acknowledgements are also gratefully made to Messrs. TOWNLEY, ROBERTS and SAWYER, for manuscript copies of observations, and other information of the greatest value.

The work of accurate observation of the phenomena of the known variables, in which these astronomers have been so assiduous — and which, as in the case of the comets, is of a much higher grade than the discovery of new objects — is the most essential element to the progress of this branch of astronomy, and is a field which affords ample room for many more participants.

This seems as appropriate a place as any for an important remark. In comparing future observations of maxima and minima with the elements of the catalogue, it should be borne in mind that the periods here given are their mean values, determined generally from long series of observations, and that any deviations, apparently larger than the accidental error of observation, are probably due to some systematic inequality in the course of development. It will be seen from an inspection of the Catalogue that, beside the forty cases among the variables of long periods for which I have determined such terms numerically, there are about thirty others where their existence is distinctly indicated. Indeed, as I have elsewhere stated, there is scarcely a case, where the observations are sufficiently continuous to give evidence on the point, in which they are not manifest; and we may safely conclude that they are generally prevalent, and inseparably associated with this type of variability. They are in general periodic, running through cycles of fifty or sixty periods on the average, sometimes of only twenty or thirty periods. The amplitude is sometimes considerable, rising to, say, a fifth of the star's period. For the most part, however, they are comprised within the limits of twenty or thirty days from the time of the phase indicated by the mean period. In the preparation of ephemerides for the use of observers, in preparing to observe the phases, it therefore does not seem advisable to apply arbitrary corrections, dependent on one or two recently observed maxima, as is sometimes done: on account of the risk of thereby influencing prejudicially the intending observer's results, which ought to be free of all bias. It seems better that his work should be done under the influence only of the general warning that such real variations from the predicted times are continually in operation, by the very nature of the phenomena. There is no class of work in which freedom from preoccupation of mind is so essential as in this. This is so especially true of the stars of the *Algol*-type that the publication of ephemerides of their minima nearer than to the nearest hour, is to be deprecated.

The above remarks of course do not apply to stars which have been recently discovered, or which have been rather infrequently observed. The uncertainty in the elements given for these will be apparent by inspection of the column "Basis of Elements," or is especially remarked in the notes at the end of the Catalogue.

Special effort has been made to supply as many epochs of minimum in the present Catalogue as the data available permitted; this being the particular in which our knowledge is most defective. From column $M—m$ it will be seen that this element is given in 115 cases, as against only 63 in the First Catalogue.

No.	Star	1900.0 R.A.	1900.0 Decl.	1900 Annual Variation		1855.0 R.A.	1855.0 Decl.	Redness	Magnitude Max.	Magnitude Min.
		h m s	° ′	s	′	h m s	° ′			
100	T Ceti	0 16 42	—20 36.7	+3.04	+0.33	0 14 26	—20 51.8	4	5.1– 5.3	6.4– 7.0
107	T Cassiopeae	17 49	+55 14.3	3.22	0.33	15 25	+54 59.3	7.3	7.0– 8.0	11.0–11.2
112	R Andromedae	18 45	+38 1.4	3.16	0.33	16 25	+37 46.4	5.0	5.6– 8.6	<12.8
114	S Ceti	18 58	— 9 53.0	3.05	0.33	16 41	—10 7.9	2.0	7.0– 8.0	12
116	B Cassiopeae	19 15	+63 35.5	3.30	0.33	16 47	+63 20.6	–	>1	?
161	T Piscium	26 49	+14 2.9	3.11	0.33	24 29	+13 48.0	0	9.5–10.2	10.5–11.0
209	α Cassiopeae	34 50	+55 59.3	3.38	0.33	32 18	+55 44.5	5	2.2	2.8
224	S Andromedae	37 15	+40 43.2	3.26	0.33	34 49	+40 28.3	5	7	0?
243	U Cassiopeae	40 46	+47 42.6	3.33	0.33	38 16	+47 27.8	6	8.0– 8.8	<15
320	U Cephei	0 53 23	+81 20.2	5.09	0.33	0 49 38	+81 5.5	0	7.1	9.2
432	S Cassiopeae	1 12 18	+72 5.1	4.35	0.32	1 9 4	+71 50.8	6.7	6.7– 8.6	<13.5
434	S Piscium	12 21	+ 8 24.3	3.13	0.32	10 0	+ 8 9.9	1.0	8.2– 9.3	<14.7
466	U Piscium	17 41	+12 20.7	3.17	0.32	15 18	+12 6.4	–	9.5	14.5–15.0
494	R Sculptoris	22 22	—33 3.5	2.77	0.31	20 17	—33 17.8	9	5.7	7.6– 8.0
513	R Piscium	25 29	+ 2 21.9	3.09	0.31	23 10	+ 2 7.9	2.0	7 – 8.8	<13
678	U Persei	52 56	+54 20.1	3.95	0.29	50 0	+54 7.0	6.4*	8.2	<11
715	S Arietis	1 59 16	+12 2.8	3.21	0.29	1 56 51	+11 49.7	2	9.1– 9.8	14?
782	R Arietis	2 10 25	+24 35.5	3.40	0.28	2 7 53	+24 22.8	1.8	7.6– 9.0	11.7–13.0
793	T Persei	12 12	+58 29.5	4.26	0.28	9 0	+58 16.7	4	8.2	9.3
806	o Ceti	14 18	— 3 25.7	3.03	0.27	12 1	— 3 38.3	5.9	1.7– 5.0	8 – 9.5
814	S Persei	15 41	+58 7.8	4.27	0.28	12 29	+57 55.2	5.0	8.5	13
845	R Ceti	20 55	— 0 37.8	3.06	0.27	18 38	— 0 50.1	2.4	7.5– 8.8	13.5
893	U Ceti	28 56	—13 35.2	2.88	0.27	26 45	—13 47.2	3	6.8– 7.3	10.5<
906	R Trianguli	30 59	+33 49.8	3.62	0.26	28 16	+33 37.8	5.4*	5.8	11.7
976	T Arietis	42 45	+17 5.5	3.34	0.25	40 15	+16 54.1	3.2	7.9– 8.6	9.3– 9.7
1072	ρ Persei	2 58 46	+38 27.2	3.83	0.24	55 54	+38 16.5	2	3.4	4.2
1090	β Persei	3 1 40	+40 34.2	3.89	0.23	2 58 45	+40 23.6	0	2.3	3.5
1113	U Arietis	5 30	+14 24	3.32	0.23	3 3 1	+14 14.0	–	7.8	<11
1222	R Persei	23 41	+35 19.6	3.81	0.21	20 50	+35 10.1	2.3	7.7– 9.2	12.8–13.5
1367	X Tauri	47 50	+ 7 28.8	3.22	0.18	45 26	+ 7 20.6	. .	6.6	8.1
1411	λ Tauri	3 55 8	+12 12.5	3.32	0.17	3 52 39	+12 4.6	0	3.4	4.2
1537	T Tauri	4 16 10	+19 17.8	3.49	0.15	4 13 33	+19 11.3	0	9.2–11.5	12.8–<13.5
1574	W Tauri	22 16	+15 53	3.42	0.14	19 43	+15 46.5	5	9?	<12.5
1577	R Tauri	22 49	+ 9 56.4	3.29	0.14	20 21	+ 9 50.1	4.5	7.4– 9.0	12.8–13.5
1582	S Tauri	23 43	+ 9 43.5	3.28	0.14	21 16	+ 9 37.3	2.5	9.5–10.0	<13.5
1623	T Camelopardalis	30 26	+65 59	5.85	0.13	26 4	+65 53	6*	7.9– 8.2	<12
1635	R Reticuli	32 30	—63 14.2	0.61	0.12	32 3	—63 19.8	–	7	<13
1654	R Doradus	35 36	—62 16.4	0.70	0.12	35 5	—62 21.8	7	5.7	6.7
1717	V Tauri	46 15	+17 22.1	3.47	0.11	43 39	+17 17.4	3.3	8.3– 9.0	<13.5
1761	R Orionis	53 35	+ 7 58.7	3.25	0.10	51 8	+ 7 54.3	4.9	8.7– 9.1	11.2–13.5
1768	ε Aurigae	54 47	+43 40.5	4.30	0.09	51 34	+43 36.2	1	3.0	4.5
1771	R Leporis	4 55 3	—14 57.4	2.73	0.09	4 53 0	—15 1.7	9.4	6 – 7	8.5?
1855	R Aurigae	5 9 13	+53 28.4	4.83	0.07	5 5 36	+53 25.0	6.5	6.5– 7.8	12.5–12.7
1923	S Aurigae	20 31	+34 3.7	3.96	0.06	17 33	+34 2.1	6.7	9.4–11.0	<14.5
1944	S Orionis	24 5	— 4 46.4	2.96	0.05	21 51	— 4 48.7	6.4	8.3– 9.5	11.0–13.0
1953	T Aurigae	25 34	+30 22.2	3.85	0.05	22 41	+30 19.9	–	4.5	<15
1981	S Camelopardalis	30 13	+68 44.6	6.48	0.04	25 22	+68 42.5	7.8*	8.5	12
1986	T Orionis	30 56	— 5 32.4	2.94	0.04	28 43	— 5 34.5	0	9.7	13
2013	U Aurigae	35 32	+31 59	3.90	0.04	32 37	+31 57	7.5*	8.6	12
2098	α Orionis	49 45	+ 7 23.3	3.25	0.02	47 19	+ 7 22.9	6	1	1.4
2100	U Orionis	5 49 53	+20 9.5	3.56	+0.01	5 47 13	+20 8.7	7	6.4– 7.5	<12
2213	η Geminorum	6 8 51	+22 32.2	+3.62	—0.01	6 6 8	+22 32.6	3	3.2	3.7– 4.2

No.	$M-m$	Elements of Maximum, Greenwich M.T. Epoch (Cal.)	(Julian)	Period	Inequalities	Remarks	Basis of Elements M	m	Dates included
	d		d	d					
100	–	. . . .		. . . .		Irregularly periodic?	–	–	
107	221	1871 Mar. 31	=2404515	+445.0 E		Periodic inequality	13	5	1842, 57, 71–91
112	170 : :	1859 Mar. 27	2400131	+410.7 E	+25 sin(12° E+90°)		21	1	1827, 55–93
114	145	1872 Dec. 27	2405155	+321.0 E			7	3	1872–91
116	–	. . . .		. . . .		New star of 1572	–	–	
161	–	. . . .		. . . .		Irregular	–	–	
209	–	. . . .		. . . .		Irregular	–	–	
224	–	. . . .		. . . .		New star of 1885 in *Androm.* neb.	–	–	
243	120	1886 Dec. 12	2410253	+276.0 E			7	2	1856, 57, 86–92
320	–	MIN. 1880 June 23d 9h 28m.0		+2d 11h 49m 38s.25E	+95m sin(0°.08E+283°)		–	50	1828, 80–93
432	300 : :	1863 Mar. 18	2401583	+610.5 E	+50 sin(10°E+50°)		14	2	1843, 63–93
434	200 :	1866 Jan. 4	2402606	+405.3 E		Periodic inequality	10	1	1855–85, 92
466	83	1880 Jan. 8	2407723	+172.7 E		Periodic inequality	12	11	1879–92
494	131 :	1872 Dec. 11	2405139	+207.5 E			4	3	1872–91
513	149	1866 Nov. 22	2402928.0	+344.15 E	+13 sin(12°E+180°)		14	2	1850, 55, 65–91
618	–	. . . .		. . . .			–	–	
715	165 :	1872 Mar. 22	2404867	+292.2 E		Periodic inequality	9	1	1848–86, 92
782	91.5	1866 Sept. 4	2402849.0	+186.60 E	+7 sin(5°E+235°)		43	21	1828–46, 58–92
793	–	. . . .		. . . .		Irregularly periodic?	–	–	
806	112.0	1866 Dec. 27	2402963.4	+331.60 E	+25 sin(4°.5E+90°)+*		105	15	1596–1892
814	–	. . . .		. . . .		Irregularly periodic?	–	–	
845	70	1867 Mar. 2	2403028.0	+167.0 E		Periodic inequality	20	3	1794, 1841–93
893	–	1884 Dec. 11	2409522	+235.8 E			8	–	1877, 84–90
906	119	1890 Sept. 30	2411641	+262 E			5	3	1856, 87–92
976	127	1873 Mar. 31	2405249	+313 E			10	9	1871–74, 84–92
1072	–	. . . .		. . . .		Irregularly periodic	–	–	
1090	–	MIN. 1888 Jan. 3d 7h 21m 29s.23		+2d 20h 48m 55.425 E	+†		–	496	1782–1887
1113	–	. . . .		. . . .			–	–	
1222	96	1861 Sept. 25	2401044.0	+210.1 E	+20 sin(7°.5E+135°)		31	3	1833, 61–92
1367	–	. . . .		. . . .			–	–	
1411	–	MIN. 1887 Dec. 6d 11h 57m.0		+3d 22h 52m 12s.0E		*Algol*-type. Per. ineq.	–	53	1796, 1844–92
1537	–	. . . .		. . . .		Irregular	–	–	
1574	78	1880 Feb. 15	2407761	+141 E		Parkhurst's elements	4	2	1880, 87–93
1577	140 :	1862 May 1	2401262	+325 E			21	2	1798, 1855–92
1582	70 :	1860 Feb. 14	2400455.5	+375.5 E			10	1	1855–59, 83–93
1623	–	1891 Dec. 24	2412091	+370 E		Elements uncertain	2	–	1891, 92
1635	–	1864 Feb. 5	2401907	+280 E			5	–	1864–67, 91, 92
1654	–	. . . .		. . . .			–	–	
1717	89	1872 Sept. 14	2405051.0	+170.4 E		Periodic inequality?	18	6	1826, 54, 71–93
1761	214 :	1855 Mar. 23	2398666	+380.0 E			12	1	1846–74, 83–92
1768	–	. . . .		. . . .		Irregular	–	–	
1771	212	1864 Mar. 5	2401936.7	+436.1 E		Periodic inequality	19	13	1855–83
1855	241	1862 Nov. 16	2401461.8	+460.6 E			17	6	1862–91
1923	–	. . . .		. . . .		Irregularly periodic	–	–	
1944	194	1870 Feb. 1	2404095	+412 E			6	11	1863–92
1953	–	. . . .		. . . .		New star of 1892	–	–	
1981	–	1892 Aug. 22	2412333	+111 E		Elements very uncertain	3	–	1892, 3
1986	–	. . . .		. . . .		Irregular	–	–	
2013	–	1891 Jan. 31	2411764	+397 E		Elements very uncertain	2	–	1891, 93
2098	–	. . . .		. . . .		Irregularly periodic	–	–	
2100	145 :	1885 Dec. 7	=2409883	+371 E		Periodic inequality	8	1	1885–93
2213	–	MIN. 1865 Nov. 5		+231.4 E		Periodic inequality	–	14	1844, 65–81

* +25 sin(1°.125 E+188°.2) † +173m.3 sin($\frac{1}{50}$ E+202°.5) +18m.0 sin($\frac{3}{40}$ E +203°.25). See notes.

No.	Star	1900.0 R.A.	1900.0 Decl.	1900 Annual Variation		1855.0 R.A.	1855.0 Decl.	Redness	Magnitude Max.	Magnitude Min.
		h m s	° ′	s	′	h m s	° ′			
2258	V Aurigae	6 16 18	+47 42.5	+4.54	−0.02	6 12 54	+47 43.5	–	8.5– 10	<11.5
2266	V Monocerotis	17 41	− 2 8.7	3.02	0.03	15 25	− 2 7.6	3.4	6.9	10.7<
2279	T Monocerotis	19 49	+ 7 8.4	3.24	0.03	17 24	+ 7 9.7	2	5.8– 6.4	7.4– 8.2
2362	R Monocerotis	33 42	+ 8 49.3	3.28	0.05	31 15	+ 8 51.7	0	9.5	13
2375	S Monocerotis	35 28	+ 9 59.3	3.31	0.05	33 0	+10 1.5	2	4.9	5.4
2478	R Lyncis	53 3	+55 28.1	4.96	0.08	49 20	+55 31.6	4.8	7.8– 8.0	<13
2509	ζ Geminorum	6 58 11	+20 43.0	3.56	0.09	55 30	+20 46.7	2	3.7	4.5
2528	R Geminorum	7 1 20	+22 51.5	3.62	0.09	6 58 37	+22 55.4	5.7	6.6– 7.8	<13.5
2539	R Canis minoris	3 13	+10 10.9	3.30	0.09	7 0 44	+10 14.9	5.5	7.2– 7.9	9.5–10.0
2583	L_2 Puppis	10 29	−44 28.8	1.82	0.10	9 7	−44 24.2	8	3.5	6.3
2610	R Canis Majoris	14 56	−16 12.4	2.70	0.11	12 55	−16 7.6	0	5.9	6.7
2625	V Geminorum	17 34	+13 17.0	3.37	0.11	15 2	+13 21.9	2.8	8.2– 9.1	12.0–14.0
2676	U Monocerotis	26 1	− 9 34.0	2.86	0.12	23 53	− 9 28.6	3	5.9– 7.3	6.6– 8.0
2684	S Canis minoris	27 18	+ 8 31.9	3.26	0.12	24 51	+ 8 37.4	4.1	7.2– 8.0	10.5–12.7
2691	T Canis minoris	28 26	+11 57.5	3.34	0.12	25 56	+12 3.0	2	9.0– 9.7	<13.5
2735	U Canis minoris	35 55	+ 8 36.8	3.26	0.14	33 28	+ 8 42.2	5.1	8.5– 9.0	12.3–13.5
2742	S Geminorum	37 3	+23 41.1	3.61	0.14	34 20	+23 47.2	3	8.2– 8.7	<13.5
2780	T Geminorum	43 18	+23 59.0	3.61	0.15	40 36	+24 5.5	3.0	8.1– 8.7	<13.5
2783	S Puppis	43 50	−47 51.9	1.74	0.15	42 31	−47 45.4	–	7.2	9
2815	U Geminorum	49 10	+22 15.8	3.56	0.15	46 30	+22 22.7	0.0	8.9– 9.7	13.1
2852	V Puppis	55 22	−48 58.4	1.73	0.16	54 4	−48 51.2	–	4.4	5.2
2857	U Puppis	7 56 8	−12 33.8	2.81	0.16	7 54 2	−12 26.6	3.2	8.5– 9.0	<14
2946	R Cancri	8 11 3	+12 2.0	3.32	0.18	8 8 34	+12 10.1	5.3	6.0– 8.3	<11.7
2976	V Cancri	16 1	+17 36.1	3.43	0.19	13 27	+17 44.5	4.3	6.8– 7.7	<12
3060	U Cancri	30 3	+19 14.4	3.44	0.20	27 28	+19 23.5	2.3	8.4–10.6	<14
3109	S Cancri	38 14	+19 23.6	3.44	0.21	35 39	+19 33.2	1	8.2	9.8
3128	R Pyxidis	41 17	−27 50.2	2.53	0.22	39 23	−27 40.5	6	8.5	<11
3170	S Hydrae	48 21	+ 3 26.7	3.13	0.22	46 0	+ 3 36.8	2.1	7.5– 8.7	<12.2
3184	T Hydrae	50 48	− 8 45.6	2.92	0.23	48 37	− 8 35.4	1.8	7.0– 8.1	<13
3186	T Cancri	8 50 57	+20 13.9	3.43	0.23	8 48 23	+20 24.1	7.4	8.0– 8.5	9.3–10.5
3407	S Antliae	9 27 56	−28 11.2	2.63	0.26	9 25 27	−27 59.4	0	6.7	7.3
3409	N Velorum	28 11	−56 35.6	1.83	0.26	26 49	−56 23.8	2	3.4	4.4
3418	R Carinae	29 44	−62 20.8	1.52	0.26	28 36	−62 8.9	5	4.3– 5.7	9.3–10.0
3477	R Leonis minoris	39 35	+34 58.3	3.61	0.27	36 52	+35 10.6	6.0	6.1– 7.8	13
3493	R Leonis	42 11	+11 53.6	3.23	0.28	39 45	+12 5.9	6.9	5.2– 6.7	9.4–10.0
3495	*l* Carinae	42 30	−62 2.8	1.65	0.28	41 16	−61 50.4	–	3.7	5.2
3567	V Leonis	9 54 28	+21 44.5	3.36	0.29	9 51 57	+21 57.3	1.7	8.6	<13.5
3633	R Antliae	10 5 27	−37 14.4	2.59	0.29	10 3 30	−37 1.2	–	6.5	<8
3637	S Carinae	6 11	−61 3.6	1.92	0.29	4 45	−60 50.4	5	6.0	9.0– 9.2
3712	U Leonis	18 42	+14 30.6	3.22	0.30	16 17	+14 44.1	–	9.5	<13.5
3796	U Hydrae	32 37	−12 51.9	2.96	0.31	30 24	−12 38.1	7	4.5	6.1–6.3
3825	R Ursae Majoris	37 34	+69 18.0	4.32	0.31	34 19	+69 32.1	1.6	6.0– 8.2	13.2
3847	η Carinae	41 11	−59 9.5	2.32	0.31	39 27	−58 55.4	5	>1	7.4
3881	V Hydrae	46 46	−20 43.2	2.91	0.32	44 34	−20 28.8	9	6.7	9.5
3890	W Leonis	48 21	+14 14.9	3.18	0.32	45 58	+14 29.2	3.5*	9	<14
3908	T Carinae	51 18	−59 54.2	2.39	0.32	49 30	−59 44.8	–	6.2	6.9
3934	R Crateris	10 55 38	−17 47.3	2.95	0.32	10 53 26	−17 32.8	8.1	>8	<9
3994	S Leonis	11 5 41	+ 6 0.2	3.11	0.32	11 3 21	+ 6 14.9	0.0	9.0–10.0	<13
4160	T Leonis	33 19	+ 3 55.5	3.08	0.33	31 0	+ 4 10.5	–	10?	<13.5
4300	X Virginis	56 44	+ 9 37.7	3.08	0.33	54 25	+ 9 52.7	–	8–10	12
4315	R Comae	11 59 7	+19 20.3	3.08	0.33	11 56 49	+19 35.4	4.0	7.4– 8.0	<13.5
4377	T Virginis	12 9 29	− 5 28.8	+3.08	−0.33	12 7 10	− 5 13.8	4.1	8.0– 8.8	10–<13.5

No.	M—m	Elements of Maximum, Greenwich M.T. Epoch (Cal.)	(Julian)	Period	Inequalities	Remarks	Basis of Elements M	m	Dates included
2258	–	1886 Dec. 9	=241 0250^d	+315^d E		Elements very uncertain	3	–	1886, 91, 92
2266	–	1883 Feb. 14	240 8843	+333.5 E			6	–	1853, 83–93
2279	7.93	1885 Apr. 1	240 9633.81	+ 27.0037 E				–	
2362	–	. . . .	. . . .	. . . .		Irregular	–	–	
2375	1.84	1870 Jan. 31	240 4094.83	+ 3.44305		Winnecke's elements; doubtful	–	–	
2478	143:	1874 Sept. 15	240 5782	+380.0 E			8	1	1874, 84–92
2509	5.015	1888 Jan. 3	241 0640.603	+ 10.15382 E		See notes	–	–	
2528	121	1868 Feb. 24	240 3387.0	+370.2 E		Periodic inequality	20	7	1796, 1855–92
2539	135	1859 Feb. 28	240 0104.5	+336.5 E		Periodic inequality	15	2	1859–74, 83–93
2583	60	1872 Mar. 28	240 4881.0	+136.50 E			6	2	1872–74, 86, 91
2610	–	Min. 1887 Mar. 26^d 15^h 18^m		+1^d 3^h 15^m 46^s.0 E		*Algol*-type	–	23	1887–93
2625	134	1880 Feb. 1	240 7747	+277.0 E			10	2	1857, 80–92
2676	18.0	1873 Apr. 19	240 5268	+ 45.20 E		See notes	–	–	
2684	164	1863 May 3	240 1629	+330.3 E	+20 sin(12°E+30°)		16	2	1856–92
2691	–	1870 Mar. 16	240 4138	+322.7 E		Periodic inequality?	9	–	1854, 70–93
2735	175	1880 Feb. 14	240 7760	+410 E			6	6	1880–93
2742	127:	1852 Feb. 27	239 7546	+294 E			18	1	1848–73, 86–93
2780	–	1848 Dec. 7	239 6369.5	+288.1 E			16	–	1848–74, 86–93
2783	–	. . . .	. . . .	. . . .			–	–	
2815	–	1892 Dec. 15	241 2448	+ 86.3 E		Irregularly periodic	–	–	
2852	–	. . . .	. . . .	. . . .				–	
2857	–	1881 Mar. 8	240 8148	+315 E			5	–	1881–83, 93
2946	125::	1852 Apr. 21	239 7600.1	+352.81 E	+0.207 E^2		18	–	1830, 52–85
2976	102:	1871 May 20	240 4568	+271.9 E			10	1	1871–89
3060	–	1853 Apr. 6	239 7950	+307.5 E	—0.06 E^2		14		1853–59, 69–93
3109	–	Min. 1867 Aug. 31^d 14^h 2^m.89		+9^d 11^h 37^m 45^s E		Schönfeld's el. *Algol*-type	–	–	
3128	–	. . . .	. . . .	. . . .			–	–	
3170	–	1857 Feb. 13	239 9359	+257.0 E		Periodic inequality	16	–	1852–86
3184		1858 Feb. 23	239 9734.5	+289.4 E		Schönfeld's elements	18	–	1851–73, 84, 92
3186	–	Min. 1858 Jan. 26	239 9706	+482 E			–	9	1858–75, 84, 87
3407	–	Min. 1888 Apr. 13^d 12^h 38^m.0		+0^d 7^h 46^m 48^s.0 E		*Algol*-type	–	15+	1888–93
3409	–	. . . .	. . . .	. . . .		Period short	–	–	
3418	153	1871 July 31	240 4640	+311.5 E		Periodic inequality	16	10	1752, 1867–92
3477	170	1865 Mar. 12	240 2308.0	+370.5 E	+20 sin(10°E+300°)		18	3	1796, 1865–87
3493	144	1757 Apr. 21	236 2902.0	+312.90 E	+25 sin(2°.75 E+318°)		46	15	1757–1890
3495	15	1871 July 24	240 4633.0	+35.05 E			24	7	1871–74, 91, 92
3567	–	1882 Apr. 10	240 8546	+274 E		Parkhurst's elements	6	–	1855, 56, 82–91
3633	–	. . . .	. . . .	. . . .			–	–	
3637	86	1872 May 8	240 4922	+148.7 E			4	3	1872–80, 91
3712		. . . .	. . . .	. . . .		Variability doubtful	–	–	
3796	–	. . . .	. . . .	. . . .		Irregularly periodic?		–	
3825	107	1853 Apr. 7	239 7951.2	+302.1 E	+15 sin(10°E+190°)		38	15	1843–92
3847	–	. . . .	. . . .	. . . .		Irregular	–	–	
3881	–	1873 Mar. 15	240 5233	+575 E		Elements very uncertain	5	3	1873–93
3890	–	1872 Feb. 12	240 4836	+394.3 E		Parkhurst's elements	6	–	1872–91
3908	–	. . . .	. . . .	. . . .			–	–	
3934	–	. . . .	. . . .	. . . .		Variability not certain	–	–	
3994	125:	1860 Dec. 1	240 0746.0	+190.0 E	+25 sin(10°E+60°)		18	1	1859–93
4160	–	. . . .	. . . .	. . . .		Variability not certain	–	–	
4300	–	. . . .	. . . .	. . . .			–		
4315	–	1856 Dec. 18	239 9302	+361 E			7	–	1831, 56, 83–91
4377	–	1861 Apr. 26	=240 0891	+339.5 E			8	–	1861–75, 84, 88

No.	Star	1900.0 R.A. (h m s)	1900.0 Decl. (° ′)	1900 Annual Variation (s)	1900 Annual Variation (′)	1855.0 R.A. (h m s)	1855.0 Decl. (° ′)	Redness	Magnitude Max.	Magnitude Min.
4407	R Corvi	12 14 27	—18 42.0	+ 3.10	—0.33	12 12 8	—18 26.9	3.7	6.8– 7.7	<11.5
4492	Y Virginis	28 44	— 3 52.3	3.08	0.33	26 25	— 3 37.3	3.6	8 – 9.4	11.5–13
4511	T Ursae Majoris	31 50	+60 2.3	2.75	0.33	29 47	+60 17.2	2.0	6.0– 8.5	12.2–13.0
4521	R Virginis	33 26	+ 7 32.3	3.05	0.33	31 9	+ 7 47.2	1.3	6.5– 8.0	9.7–11.0
4536	R Muscae	35 58	—68 51.5	3.61	0.33	33 17	—68 36.7	–	6.6	7.4
4557	S Ursae Majoris	39 34	+61 38.4	2.63	0.33	37 35	+61 53.3	3.2	6.7– 8.2	10.2–11.5
4596	U Virginis	12 46 1	+ 6 5.8	3.04	0.33	12 43 45	+ 6 20.6	1.1	7.7– 8.1	12.2–12.8
4731	S Canum Venat.	13 8 31	+37 54.5	2.77	0.32	13 6 24	+38 8.9	6.3*	7.3	9
4805	W Virginis	20 52	— 2 51.5	3.09	0.31	18 33	— 2 37.4	0.4	8.7– 9.2	9.8–10.4
4816	V Virginis	22 38	— 2 39.2	3.09	0.31	20 19	— 2 25.2	2.7	8.0– 9.0	<13
4826	R Hydrae	24 15	—22 45.9	3.27	0.31	21 48	—22 31.8	5.9	3.5– 5.5	9.7
4847	S Virginis	27 47	— 6 40.8	3.13	0.31	25 26	— 6 26.8	2.6	5.7– 7.8	12.5
4940	W Hydrae	43 23	—27 52.0	3.38	0.30	40 51	—27 38.5	7	6.7	8.0
4948	R Canum Venat.	44 39	+40 2.4	2.58	0.30	42 43	+40 15.9	–	6.7– 7.0	11.5
5037	RR Virginis	13 59 35	— 8 43.1	3.17	0.29	13 57 12	— 8 30.0	–	>11	<14
5070	Z Virginis	14 4 58	—12 49.8	3.23	0.29	14 2 33	—12 36.5	–	9.5–11	<14
5095	R Centauri	9 22	—59 26.9	4.28	0.28	6 10	—59 14.1	6	6.0– 6.3	8.7– 9.8
5097	T Bootis	9 25	+19 32.0	2.82	0.28	7 18	+19 44.7	–	9.7?	<13
5156	X Bootis	19 27	+16 46.4	2.84	0.27	17 19	+16 58.8	4	9.0– 9.4	10.2
5157	S Bootis	19 32	+54 15.9	+2.01	0.27	18 1	+54 28.3	2.8	7.7– 8.5	12.5–13.2
5190	R Camelopardalis	25 6	+84 17.1	—4.83	0.27	28 54	+84 29.2	2.1	7.2– 8.6	11.8–13.5
5194	V Bootis	25 42	+39 18.5	+2.42	0.27	23 54	+39 30.4	3.6	6.9– 7.3	9.2–10.5
5237	R Bootis	32 47	+27 10.2	2.65	0.26	30 48	+27 22.1	2.7	5.9– 7.8	11.3–12.2
5249	V Librae	34 48	—17 13.6	3.33	0.26	32 18	—17 1.8	–	9.3	12.2
5274	W Bootis	39 2	+26 57.2	2.64	0.26	37 3	+27 8.9	–	5.2	6.1
5319	R Apodis	46 28	—76 15.3	6.70	0.26	41 30	—76 4.0	–	5.5	6.2
5338	U Bootis	49 42	+18 6.0	2.78	0.25	47 37	+18 17.1	2.7	9.1– 9.3	12–13.6
5374	δ Librae	14 55 38	— 8 7.3	3.20	0.24	53 14	— 7 56.4	1	5.0	6.2
5402	T Triang. Austr.	15 0 24	—68 20.1	5.46	0.24	14 56 20	—68 9.4	–	6.9	7.4
5430	T Librae	5 2	—19 38.3	3.42	0.23	15 2 28	—19 27.8	–	9.2–10.2	<14.7
5438	Y Librae	6 24	— 5 38.0	3.17	0.23	4 2	— 5 27.6	–	8.5	?
5465	R Triang. Austr.	10 49	—66 7.7	5.31	0.22	6 52	—65 57.5	–	6.6– 6.8	7.5– 8.0
5484	U Coronae	14 7	+32 0.8	2.45	0.22	12 17	+32 10.8	0.0	7.5	8.9
5494	S Librae	15 39	—20 1.6	3.44	0.22	13 4	—19 51.7	3.0	7.6– 8.3	<13
5501	S Serpentis	16 59	+14 40.4	2.81	0.22	14 52	+14 50.3	4.1	7.6– 8.7	12.5?
5504	S Coronae	17 19	+31 43.6	2.45	0.22	15 29	+31 53.5	4.9	6.1– 7.8	11.9–12.5
5583	X Librae	30 26	—20 50.0	3.48	0.20	27 50	—20 40.8	–	9.5– 9.9	14
5593	W Librae	32 12	—15 50.6	3.37	0.20	29 40	—15 41.5	–	9.8	<14
5617	U Librae	36 13	—20 51.5	3.48	0.20	33 37	—20 42.6	3.4	9	<14
5644	Z Librae	40 42	—20 48.8	3.49	0.19	38 5	—20 40.1	–	11	<13
5667	R Coronae	44 27	+28 27.8	2.47	0.19	42 36	+28 36.3	0.5	5.8	13.0
5675	V Coronae	45 57	+39 52.3	2.14	0.18	44 21	+40 0.7	5.9	7.2– 7.7	10.3–12.0
5677	R Serpentis	46 5	+15 26.3	2.76	0.18	44 1	+15 34.6	3.7	5.6– 7.6	15
5682	R Lupi	46 59	—35 59.9	3.88	0.18	44 5	—35 51.6	–	9	<11
5688	R Librae	47 56	—15 56.3	3.39	0.18	45 24	—15 48.1	2	9.2–10.0	<13
5704	RR Librae	50 39	—18 0.7	3.44	0.18	48 4	—17 52.6	3	8.4	14
5713	S Triang. Austr.	52 12	—63 29.5	5.35	0.18	48 12	—63 21.4	–	6.5	7.5
5732	T Coronae	55 19	+26 12.2	2.51	0.17	53 26	+26 20.1	1	2.0	9.5
5758	X Herculis	15 59 39	+47 30.8	1.81	0.17	58 18	+47 38.4	7	6.0	7.2
5761	Z Scorpii	16 0 8	—21 27.7	3.53	0.17	57 29	—21 20.1	–	9	12?
5770	R Herculis	1 44	+18 38.4	2.68	0.16	15 59 43	+18 45.9	2.0	8.0– 9.2	<13
5776	X Scorpii	16 2 40	—21 15.6	+3.53	—0.16	16 0 2	—21 8.3	–	>11	<13

No.	$M-m$	Elements of Maximum, Greenwich M.T. Epoch (Cal.)	(Julian)	Period	Inequalities	Remarks	Basis of Elements M	m	Dates included
4407	–	1868 June 11=	240 3495.8^d	+317.2^d E		Periodic inequality?	12	–	1796, 1851–90
4492	85 :	1883 Mar. 10	240 8880	+218.8 E			4	2	1882–93
4511	107.5	1860 Oct. 21	240 0705.8	+257.2 E	+20 sin(9°E+90°)		35	13	1843, 60–93
4521	68.5	1809 June 0	238 1934.8	+145.47E	+20 sin($\frac{3}{5}$°E+216°)+4.8 sin($\frac{4.5}{8}$°+343°)		87	28	1809–91
4536	0.295	1871 Aug. 16	240 4656.656	+ 0.882253 E			19	15	1871–92
4557	113.0	1860 June 24	240 0586.0	+226.1 E	+43 sin(5°.76E+181°.5)		54	32	1790, 1843–92
4596	88	1866 June 25	240 2778.0	+207.0 E		Periodic inequality	20	7	1813–31, 57–93
4731	–	. . . .		. . . .			–	–	
4805	8.20	1866 Apr. 16	240 2708.2666	+17.2711 E			41	45	1866–72, 89–92
4816	–	1860 Feb. 15	240 0456.5	+250.5 E			15	–	1857–75, 83–92
4826	190	1891 July 17	241 1931.0	+425.15 E	—0.36E²+15 sin(7°.5E+202°)		24	6	1784–1890
4847	157 :	1852 Jan. 24	~~240~~7512	+376.4 E	+20 sin(7°.5E+180°)		17	2	1795, 1824–93
4940	–	1889 Feb. 27	241 1061	+384 E			5		1875, 89–93
4948	–	1888 Mar. 25	241 0722	+340 E			6	–	1858, 85–91
5037	–	1879 May 13	240 7483	+217 E			8		1873, 79–92
5070	–	1880 May 25	240 7861	+305 E			7		1855, 80–91
5095	60 :	1871 May 25	240 4573	+160.5 E			8	3	1871–78, 91, 92
5097	–	. . . .		. . . .		Only one appearance known	–	–	
5156	79	1880 July 3	240 7900	+121.5 E			7	7	1880–84, 88–92
5157	130	1863 Apr. 13	240 1609.0	+274.0 E	—0.073E²		32	6	1790, 1865–92
5190	135	1869 Aug. 29	240 3939	+269.5 E		Periodic inequality	31	7	1862–92
5194	97	1884 Aug. 30	240 9419	+256 E		Dunér's elements	4	3	1884–92
5237	101.5	1858 June 8	239 9839	+223.4 E	+10 sin(10°E+80°)		31	17	1858–90
5249	–	1882 Apr. 30	240 8566	+370 E			3	–	1880–89
5274	–	. . . .		. . . .		Irregular	–	–	
5319	–	. . . .		. . . .			–	–	
5338	80	1880 Mar. 25	240 7800.5	+173.8 E			11	5	1857, 80–93
5374	–	Min. 1867 Oct. 25^d 9^h 17^m.5		+2^d 7^h 51^m 22^s.8 E		*Algol*-type	–	93	1797, 1837–88
5402	–	. . . .		0.98			–	–	
5430	105	1878 Apr. 30	240 7105	+238 E			5	3	1878–92
5438	–	1861 June 22	240 0949	+327 E			4	–	1861, 78, 87, 88
5465	0.83	1871 July 14	240 4623.71	+ 3.38922 E			3	3	1871, 72, 91
5484	–	Min. 1870 Mar. 25^d 10^h 38^m.5		+3^d 10^h 51^m 12^s.4E	— 0^s.0018E²	*Algol*-type	–	37	1858–89
5494	100 :	1874 June 17	240 5692	+192.3 E			9	1	1874–93
5501	–	1828 Apr. 16	238 8829	+365.1 E	+59 sin(6°E+8°)		30	–	1794, 1828–92
5504	116	1860 Aug. 24	240 0647	+360.8 E			28	10	1860–92
5583	80	1878 July 17	240 7183	+163.6 E			13	1	1878–93
5593	–	1878 May 27	240 7132	+206 E			9	–	1878–92
5617	–	1873 July 23	240 5363	+226.2 E		Periodic inequality?	11	–	1849, 73–93
5644	–	1878 May 4	240 7109	+295 E			4	–	1878–86
5667	–	. . . .		. . . .		Irregular	–		
5675	171	1878 Oct. 21	240 7279	+356.5 E			13	4	1857–61, 78–92
5677	151	1827 May 14	238 8491	+357,2 E	+35 sin(4°.5E+22°.5)		30	5	1783, 1827–90
5682		. . . .		. . . .			–	–	
5688		1858 Apr. 6	239 9776	+730 E			4	–	1858–68, 84
5704		1885 June 17	240 9710	+277.0 E			5	–	1851, 85–91
5713		. . . .		6.3				–	
5732		. . . .		. . . .		New star of 1866	–	–	
5758	–	. . . .		. . . .			–	–	
5761		1873 May 31	240 5306	+368 E			9	–	1854, 73–92
5770		1865 July 18	240 2436	+317.7 E	+20 sin(12°E+324°)		21	–	1825, 56–92
5776	–	1876 Apr. 19=	240 0634	+199.0 E			9	–	1876–91

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No.	Star	1900.0 R.A.	1900.0 Decl.	1900 Annual Variation		1855.0 R.A.	1855.0 Decl.	Redness	Magnitude Max.	Magnitude Min.
		h m s	° ′	s	′	h m s	° ′			
5795	W Scorpii	16 5 55	—19 52.6	+3.50	—0.16	16 3 18	—19 45.3	–	10–11.2	<14.7
5826	T Scorpii	11 5	—22 43.6	3.57	0.15	8 25	—22 36.7	–	7.0	<12
5830	R Scorpii	11 41	—22 41.9	3.57	0.15	9 1	—22 35.0	0.9	9.4–10.5	<13
5831	S Scorpii	11 42	—22 39.0	3.57	0.15	9 2	—22 32.0	0	9.1–10.5	<13
5856	W Ophiuchi	16 2	— 7 27.5	3.23	0.15	13 36	— 7 21.3	6	8.9– 9.5	<13.5
5860	U Scorpii	16 45	—17 38.5	3.46	0.15	14 10	—17 1.9	–	9?	<12
5887	V Ophiuchi	21 10	—12 12.0	3.33	0.14	18 40	—12 5.5	6.6	7.0– 7.5	9.6–10.5
5889	U Herculis	21 22	+19 7.2	2.65	0.14	19 23	+19 13.6	6.5	6.6– 7.8	11.4–12.7
5903	Y Scorpii	23 49	—19 13.3	3.50	0.14	21 12	—19 7.1	–	10?	14
5912	*g* Herculis	25 21	+42 6.1	1.97	0.13	23 53	+42 12.2	3	4.7– 5.5	5.4– 6.0
5928	T Ophiuchi	28 1	—15 55.2	3.42	0.13	25 27	—15 49.2	–	10	<12.5
5931	S Ophiuchi	28 30	—16 57.0	+3.45	0.13	25 55	—16 51.1	1	8.3– 9.0	<13
5948	R Ursae minoris	31 18	+72 28	—0.84	0.13	31 57	+72 34.4	3.2	8.6– 9.0	10.5
5950	W Herculis	31 41	+37 32.4	+2.13	0.13	30 5	+37 38.1	3.2	8.0– 8.4	11.5–14
5952	Y Herculis	32 0	+ 7 18.6	2.91	0.13	29 50	+ 7 23.3	–	6.9	8.0
5955	R Draconis	32 23	+66 57.8	0.14	0.12	32 17	+67 3.5	2.0	6.5– 8.7	12–13
6005	S Draconis	40 46	+55 7.2	1.27	0.11	39 49	+55 11.8	–	7.3	9.2
6044	S Herculis	47 21	+15 6.6	2.73	0.10	45 18	+15 11.4	5.6	5.9– 7.5	11.5–13
6083	Ophiuchi	16 53 54	—12 44.4	3.36	0.10	51 23	—12 40.0	5	5.5	12.5
6132	R Ophiuchi	17 2 1	—15 57.6	3.44	0.08	16 59 27	—15 53.7	4.5	7.0– 8.1	<12
6181	α Herculis	10 5	+14 30.2	2.73	0.07	17 8 2	+14 33.5	5	3.1	3.9
6189	U Ophiuchi	11 27	+ 1 19.3	3.04	0.07	9 11	+ 1 22.6	0	6.0	6.7
6202	*u* Herculis	13 38	+33 12.3	2.21	0.07	11 58	+33 15.5	4	4.6	5.4
6268	Serpentarii	24 38	—21 23.7	3.59	0.05	21 57	—21 21.2	–	>1	?
6368	X Sagittarii	41 16	—27 47.6	3.77	0.03	38 26	—27 46.2	1	4	6
6404	Y Ophiuchi	47 17	— 6 7.1	3.22	—0.02	44 52	— 6 6.2	–	6.2	7.0
6472	W Sagittarii	17 58 38	—29 35.1	3.83	0.00	17 55 45	—29 34.9	1	4.8	5.8
6512	T Herculis	18 5 19	+31 0.2	2.27	+0.01	18 3 37	+30 59.9	1.4	6.9– 8.5	9.8–12.7
6573	Y Sagittarii	15 30	—18 54.3	3.53	0.02	12 51	—18 55.2	0	5.8	6.6
6624	T Serpentis	23 56	+ 6 14.0	2.93	0.03	21 44	+ 6 12.5	2.0	9.1–10.5	<13.5
6636	U Sagittarii	26 0	—19 11.7	3.54	0.04	23 21	—19 13.3	3.7	7.0	8.3
6682	X Ophiuchi	33 35	+ 8 44.4	2.87	0.05	31 26	+ 8 42.3	5	6.8	9.0
6726	T Aquilae	40 56	+ 8 38.3	2.87	0.06	38 47	+ 8 35.7	3.3	8.8	10.0
6733	R Scuti	42 9	— 5 48.7	3.21	0.06	39 45	— 5 51.4	4	4.7– 5.7	6.0– 9.0
6758	β Lyrae	46 23	+33 14.8	2.21	0.07	44 44	+33 11.8	1	3.4	4.5
6760	κ Pavonis	46 38	—67 21.5	6.21	0.07	41 58	—67 24.4	–	4.0	5.5
6794	R Lyrae	52 17	+43 48.8	1.82	0.08	50 55	+43 45.5	4	4.0	4.7
6806	S Coronae austr.	54 26	—37 5.3	4.06	0.08	51 22	—37 8.6	–	<9.5	13.0
6811	R Coronae austr.	55 9	—37 5.6	4.06	0.08	52 8	—37 8.8	–	9.8–11.5	13.2
6812	T Coronae austr.	55 14	—37 6.4	4.06	0.08	52 12	—37 9	–	<9.8	13
6834	V Aquilae	18 59 4	— 5 50.0	3.21	0.09	56 40	— 5 53.7	6.3*	6.5	8.0
6849	R Aquilae	19 1 33	+ 8 4.8	2.89	0.09	18 59 23	+ 8 0.8	5.5	5.9– 7.4	10.9–11.5
6903	T Sagittarii	10 28	—17 8.7	3.47	0.10	19 7 52	—17 13.2	6.5	7.6– 8.1	<11
6905	R Sagittarii	10 49	—19 29.0	3.52	0.10	8 11	—19 33.5	3.6	7.0– 8.0	12.5
6921	S Sagittarii	13 35	—19 12.4	3.51	0.11	10 57	—19 17.1	0	9.1–10.4	14.5
6923	Z Sagittarii	13 47	—21 6.6	3.56	0.11	11 7	—21 11.2	2	8.5	<12
6984	U Aquilae	23 58	— 7 15.0	3.23	0.12	21 33	— 7 20.3	0	6.4	7.1
7045	R Cygni	34 8	+49 58.5	1.61	0.13	32 56	+49 52.5	6.0	5.9– 8.0	<14
7085	RT Cygni	40 50	+48 31.9	1.70	0.14	39 33	+48 25.5	–	7?	11?
7101	11 Vulpeculae	43 28	+27 4.2	2.46	0.15	41 37	+26 57.7	–	3	?
7106	S Vulpeculae	44 18	+27 2.3	2.46	0.15	42 27	+26 55.7	3.0	8.4– 8.9	9.0–10.0
7120	χ Cygni	19 46 44	+32 39.7	+2.31	+ 0.15	19 45 0	+32 33.0	6.5	4.0– 6.5	13.5

No.	$M-m$	Elements of Maximum, Greenwich M.T. Epoch (Cal.)	(Julian)	Period	Inequalities	Remarks	Basis of Elements M	m	Dates included
5795	146:	1876 May 26	=240 6401^d	+222.3^d E			11	2	1876–92
5826	–	. . . .	. . . .	. . . .		New star of 1860 in *Messier* 80	–	–	
5830	–	1863 Mar. 25	240 1590.5	+224.5 E		Periodic inequality	22	–	1837–53, 63–91
5831	–	1837 June 1	239 2162.4	+176.7 E			23	–	1837, 39, 54–83
5856	–	1881 July 10	240 8272	+331.3 E			5	–	1823, 81–93
5860	–	. . . .	. . . .	. . . .		Only one appearance known		–	
5887	–	1874 May 16	240 5660	+304 E			8	–	1874–92
5889	167	1860 Nov. 8	240 0723	+409 E		Periodic inequality?	16	6	1860–85, 93
5903	–	1876 June 26	240 6432	+359 E			3		1876, 80, 83
5912		. . . .	. . . .	. . . .		Irregular	–		
5928	–	1860 Apr. 6	240 0507	+361 E			5	–	1860, 69–74, 83
5931	–	1857 June 29	239 9495	+233.8 E			7		1857–71, 89–93
5948	–	. . . .	. . . .	. . . .		Irregularly periodic	–	–	
5950	125	1879 July 12	240 7543	+280.0 E	+25 sin(15°E+330°)		12	4	1857, 79–92
5952	–	. . . .	. . . .	20.5			–	–	
5955	112	1877 Apr. 5	240 6715.8	+245.6 E			17	3	1790, 1858–92
6005	–	. . . .	. . . .	. . . .			–	–	
6044	148	1856 Sept. 9	239 9202	+307.6 E	+45 sin(10°E+90°)		21	9	1840–90
6083	–	. . . .	. . . .	. . . .		New star of 1848	–		
6132	–	1857 July 11	239 9567	+302.9 E			9	–	1847, 57–90
6181	–	. . . .	. . . .	. . . .		Irregular	–		
6189	–	MIN. 1881 July	17^d 14^h 45^m.0	+20^h 7^m 42^s.56E	+80^m sin(0°.0225E+140°.0)		–	98	1863, 71, 81–92
6202	–	. . . .	. . . .	. . . .		Irregularly periodic	–	–	
6268	–	. . . .	. . . .	. . . .		New star of 1604	–	–	
6368	2.876	1870 Aug. 16	240 4291.78	+ 7.01185 E			388	367	1866–88
6404	6.250	1882 Sept. 4	240 8693.43	+ 17.12564 E		Sawyer's elements	25	26	1882, 86–91
6472	3.00	1866 Sept. 4	240 2849.45	+ 7.59460 E			–	–	
6512	78.0	1868 Mar. 9	240 3401.0	+164.85 E	+8 sin(7°E+59°)		37	28	1856–92
6573	1.80	1886 Sept. 25	241 0175.02	+ 5.7732 E			–	–	
6624	–	1861 May 11	240 0907.0	+342.3 E			15	–	1861–74, 83–89
6636	2.97	1870 July 1	240 4245.00	+ 6.7446 E				–	
6682	196	1886 Apr. 15	241 0012	+354 E			3	4	1854, 86–92
6726	–	. . . .	. . . .	. . . .		Irregular		–	
6733	35	1886 Aug. 22	241 0141	+ 71.1 E			–		
6758	–	MIN. 1855 Jan.	6^d 14^h 28^m.7	+12^d 21^h 46^m 58^s.3 E	+0^s.4217 E^2 —0.00007 E^3		–	–	
6760	4.0	1871 Dec. 3	240 4765	+ 9.102 E			5	3	1871–73, 83, 91
6794	15.0	1887 Oct. 16	241 0561	+ 46.0 E				–	
6806	–	. . . .	. . . .	. . . .				–	
6811	–	. . . .	. . . .	30.6				–	
6812	–	. . . .	. . . .	. . . .				–	
6834	–	. . . .	. . . .	. . . .			–	–	
6849	144	1856 Aug. 5	239 9167	+351.0 E	—0.34 E		16	5	1854–59, 69–92
6903	–	1866 Sept. 10	240 2855	+384 E			6	–	1865–70, 83
6905	158:	1866 July 18	240 2801	+268.7 E	+20 sin(14°.4 E+296°)		14	1	1849, 58–92
6921	110::	1866 Sept. 25	240 2870	+230.6 E		Periodic inequality	10	1	1863–71, 83–92
6923	–	. . . .	. . . .	. . . .			–		
6984	2.25	1886 Sept. 20	241 0170.146	+ 7.02645 E		Yendell's elements	45	22	1886–92
7045	150	1854 Oct. 16	239 8508.9	+425.7 E			25	7	1817, 52–92
7085	–	. . . .	. . . .	. . . .				–	
7101	–	. . . .	. . . .	. . . .		New star of 1670	–	–	
7106	26.5	1865 Jan. 2	240 2239.0	+ 67.50 E	+4 sin(3°.6E+20°)		48	44	1836, 37, 62–86
7120	171.5	1763 June 3	=236 5136.5	+406.02 E	+0.0075E^2+25 sin(5°E+272°)		85	8	1687–1891

No.	Star	1900.0 R.A.	1900.0 Decl.	1900 Annual Variation		1855.0 R.A.	1855.0 Decl.	Redness	Magnitude Max.	Magnitude Min.
		h m s	° ′	s	′	h m s	° ′			
7124	η Aquilae	19 47 23	+ 0 44.9	+3.06	+0.15	19 45 5	+ 0 38.2	2	3.5	4.7
7149	S Sagittae	51 29	+16 22.2	2.73	0.16	49 25	+16 15.4	0	5.6	6.4
7192	Z Cygni	19 58 38	+49 45.9	1.70	0.17	19 57 21	+49 38.4	9.0*	7.1– 8.5	11.5–12
7220	S Cygni	20 3 24	+57 41.9	1.26	0.17	20 2 28	+57 34.2	5.1	8.8–11.3	<14.5
7234	R Capricorni	5 42	—14 33.8	3.37	0.17	3 10	—14 41.6	4	8.8– 9.7	<13
7242	S Aquilae	7 1	+15 19.4	2.76	0.18	4 57	+15 11.5	0.8	8.4–10.1	10.7–11.8
7252	W Capricorni	8 36	—22 16.8	3.54	0.18	5 57	—22 24.8	–	10.2–10.5	<14.7
7257	R Sagittae	9 30	+16 25.4	2.74	0.18	7 27	+16 17.4	0.8	8.5– 8.7	9.8–10.4
7259	RS Cygni	9 45	+38 27.8	2.18	0.18	8 7	+38 17.4	9.4*	6.8	8.3–10
7261	R Delphini	10 5	+ 8 47.1	2.90	0.18	7 55	+ 8 39.1	4.0	7.6– 9.0	11.1–12.8
7285	P Cygni	14 6	+37 43.3	2.21	0.18	12 27	+37 35.1	2	3–5	<6
7299	U Cygni	16 30	+47 34.7	1.86	0.19	15 7	+47 26.3	9.3	7.0– 8.1	9.4–11.6
7428	V Cygni	38 5	+47 47.1	1.93	0.21	36 28	+47 37.5	8.3	6.8– 9.5	13.5
7431	S Delphini	38 28	+16 43.7	2.76	0.21	36 24	+16 34.2	6.0	8.4– 9.5	10.4–12.0
7437	X Cygni	39 29	+35 13.6	2.35	0.21	37 44	+35 4.0	0	6.4	7.2–7.7
7444	T Delphini	40 43	+16 2.1	2.78	0.22	38 38	+15 52.5	2.0	8.2–10.3	<13
7446	U Delphini	40 53	+17 43.7	2.75	0.22	38 50	+17 34.0	7	6.4	7.3
7455	U Capricorni	42 34	—15 9.1	3.35	0.22	40 4	—15 18.8	–	10.2–10.8	<13
7456	RR Cygni	42 37	+44 30.2	2.07	0.22	41 3	+44 20.4	6.7*	8.1– 8.7	9.3– 9.7
7459	T Cygni	43 11	+34 0.4	2.39	0.22	41 24	+33 50.6	1	5.5?	6?
7468	T Aquarii	44 40	— 5 31.1	3.17	0.22	42 17	— 5 40.9	1.2	6.7– 8.7	12.4–13.0
7483	T Vulpeculae	47 13	+27 52.5	2.55	0.22	45 19	+27 42.3	0	5.5	6.5
7488	Y Cygni	48 4	+34 17.0	2.40	0.22	46 16	+34 7.0	0	7.1	7.9
7560	R Vulpeculae	20 59 56	+23 25.5	2.66	0.24	57 56	+23 14.9	2.0	7.5– 8.5	12.5–13.6
7571	V Capricorni	21 1 47	—24 19.3	3.50	0.24	20 59 9	—24 30.2	–	9	14?
7577	X Capricorni	2 50	—21 45.1	3.44	0.24	21 0 15	—21 55.8	–	9.5–10	<16.2
7609	T Cephei	8 13	+68 5.0	0.81	0.24	7 33	+67 54.4	6.3	5.2– 6.8	9.5–9.9
7659	T Capricorni	16 30	—15 35.0	3.32	0.25	14 0	—15 46.4	2	8.8– 9.7	13 5
7733	Y Capricorni	28 55	—14 25.1	3.28	0.26	26 27	—14 36.9	–	10?	14?
7754	W Cygni	32 14	+44 55.6	+2.27	0.27	30 34	+44 43.7	4.2*	5.0– 6.3	6.1–6.7
7779	S Cephei	36 28	+78 10.3	—0.67	0.27	36 57	+77 58.2	9.1	7.4– 9.2	11.5
7783	RU Cygni	37 19	+53 52.2	+2.00	0.27	35 46	+53 40.0	–	7.6	9.1
7787	Q Cygni	37 47	+42 23.1	2.36	0.27	36 1	+42 11.0	3	3	13.5
7795	RV Cygni	39 8	+37 33.6	2.48	0.27	37 18	+37 21.2	9.0*	7.1–7.8	8.8–9.3
7803	μ Cephei	40 27	+58 19.3	1.83	0.27	39 4	+58 7.0	6.2	4?	5?
7907	U Aquarii	57 52	—17 6.5	3.28	0.29	55 24	—17 19.5	–	10?	14?
7909	S Piscis austrini	21 58 2	—28 32.0	3.44	0.29	21 55 27	—28 44.9	–	8.7– 9.2	<11
7944	T Pegasi	22 4 1	+12 3.0	2.93	0.29	22 1 49	+11 49.9	3	8.5– 9.3	<13
7994	R Piscis austrini	12 19	—30 6.2	3.42	0.30	9 45	—30 19.6	–	5.7?	<11?
8068	S Lacertae	24 38	+39 48.2	2.62	0.31	22 40	+39 34.3	–	8.4	<12
8073	δ Cephei	25 27	+57 54.2	2.22	0.31	23 48	+57 40.4	2	3.7	4.9
8093	R Indi	28 53	—67 48.3	4.34	0.31	25 36	—68 2.1	–	9?	11?
8153	R Lacertae	38 50	+41 50.9	2.66	0.31	36 50	+41 36.8	1.8	8.3– 9.3	<13.5
8230	S Aquarii	51 45	—20 52.6	3.22	0.32	49 20	—21 7.0	4.0	7.7– 9.1	<12.5
8273	β Pegasi	22 58 55	+27 32.4	2.90	0.32	56 45	+27 17.8	2	2.2	2.7
8290	R Pegasi	23 1 38	+10 0.2	3.01	0.32	22 59 22	+ 9 45.7	4	6.9– 7.9	<13
8373	S Pegasi	15 29	+ 8 22.3	3.03	0.33	23 13 13	+ 8 7.6	1.7	7.3– 8.0	<13
8512	R Aquarii	38 39	—15 50.3	3.11	0.35	36 19	—16 5.3	4.3	5.8– 8.5	11?
8588	R Phœnicis	51 16	—50 20.6	3.13	0.33	48 55	—50 35.6	–	8.5?	11?
8591	V Cephei	51 44	+82 38.1	2.70	0.33	49 44	+82 23.0	–	6.2– 6.4	7.1
8597	V Ceti	52 47	— 9 31.1	3.08	0.33	50 29	— 9 46.1	–	8.5– 9.5	14?
8600	R Cassiopeae	23 53 19	+50 49.9	+3.02	+0.33	23 51 4	+50 34.9	6.5	4.8– 7.0	9.7–12

No.	$M-m$	Elements of Maximum, Greenwich M.T. Epoch (Cal.)	(Julian)	Period	Inequalities	Remarks	Basis of Elements M	m	Dates included
7124	$2^d\ 9^h$	1888 Jan. $6^d\ 12^h\ 32^m$		$+7^d\ 4^h\ 14^m\ 0^s.0$ E			–	–	
7149	3.40	1876 Dec. 13	=240 6602.60	+ 8.38320 E			81	55	1876–91
7192	125 :	1887 Mar. 11	241 0342	+265 E			6	4	1887–92
7220	144 : :	1865 June 29	240 2417	+322.8 E	+15 sin(15°E+45°)		30	1	1841, 60–92
7234	–	1859 Dec. 12	240 0391	+345 E		Elements uncertain	5	–	1859–68
7242	72	1865 Nov. 12	240 2553	+146.7 E			27	26	1855–91
7252	87 : :	1872 June 27	240 4972	+209 E			8	1	1872–91
7257	16.0	1859 Nov. 12	240 0361.0	+ 70.52 E	+5 sin(2°.5E+55°)	See notes	133	54	1859–92
7259	–	. . . .		. . . .		Irregularly periodic	–		
7261	–	1865 Aug. 26	240 2475	+285.5 E		Periodic inequality?	10	–	1851, 59–83, 93
7285	–	. . . .		. . . .		So called new star of 1600		–	
7299	229.0	1871 June 7	240 4586.0	+463.5 E	+12 sin(36°E+324°)		15	16	1871–92
7428	220	1881 June 12	240 8244	+418 E			8	2	1857, 81–92
7431	118	1866 Jan. 19	240 2661	+277.5 E			14	11	1863–92
7437	6.8	1886 Oct. 10	241 0190.55	+ 16.389 E			54	48	1886–90, 92
7444	–	1864 Sept. 11	240 2128	+331.9 E			16	–	1855, 63–92
7446	–	. . . .		. . . .		Irregular?	–	–	
7455	–	1857 Sept. 15	239 9573.5	+202.5 E		Periodic inequality	10	–	1852–59, 72–92
7456	–	. . . .		. . . .				–	
7459	–	. . . .		. . . .			–		
7468	88	1861 Nov. 16	240 1096.0	+203.3 E	+8 sin(7°.5E+255°)		19	4	1794, 1865–93
7483	1.30	1885 Nov. 2	240 9848.95	+ 4.4362 E			54	39	1885, 86, 91
7488	–	Min. 1886 Dec. $9^d\ 12^h\ 20^m\ 10^s + 1^d\ 11^h\ 57^m\ 22^s$ E*.				See notes.	–	66	1886–92
7560	~~6.20~~	1865 Sept. 18	240 2498.0	+136.90 E	+18 sin(4°E+80°)		27	10	1807, 10, 59–88
7571	–	1867 Aug. 18	240 3197	+157.1 E		Periodic inequality	10	–	
7577	117	1867 Aug. 17	240 3196	+218.1 E		Periodic inequality?	9	1	1867, 76–91
7609	193	1873 Aug. 29	240 5400	+383.3 E			13	7	1789, 1841–92
7659	135 :	1855 Oct. 21	239 8878	+269.2 E			14	1	1850–72, 83, 91
7733	–	1885 Sept. 5	240 9790	+206 E		Elements uncertain	3	–	1871, 85, 89
7754	72.9	1884 Nov. 30	240 9511.3	+130.8 E		Yendell's elements	21	17	1885–92
7779	257	1865 June 21	240 2409	+484 E			12	4	1789, 1841–93
7783	–	. . . .		. . . .			–	–	
7787	–	. . . .		. . . .		New star of 1876	–		
7795	–	. . . .		. . . .			–		
7803	–	. . . .		. . . .		Irregularly periodic	–		
7907	–	1875 Aug. 4	240 6105	+258 E		Elements uncertain	8		1875–92
7909	–	1890 Sept. 9	241 1620	+272 E		Holetschek's elements	2	–	1890, 92
7944	–	1864 Oct. 6	240 2151	+373 E		Periodic inequality	14		1822, 54–83
7994	–	. . . .		. . . .			–		
8068	–	. . . .		. . . .			–	–	
8073	$1^d 14^h 36^m$	1840 Sept. $26^d\ 10^h\ 50^m + 5^d\ 8^h\ 47^m\ 39^s.3\ E - 0^s.0008\ E^2 - 0^s.000\,000\,15\ E^3$					289	278	1785–1889
8093		. . . .		. . . .			–	–	
8153	–	1883 Feb. 15	240 8857	+299.8 E			7	–	1856, 83–92
8230	–	1859 Dec. 16	240 0395	+279.7 E		Periodic inequality?	14	–	1798, 1853–92
8273	–	. . . .		. . . .		Irregular	–	–	
8290	172 :	1850 Dec. 26	239 7118	+380.0 E	+30 sin(10E°+200°)		19	5	1841–55, 66–92
8373	–	1864 Dec. 4	240 2210.5	+317.5 E			7	–	1864–84, 92
8512	–	1811 Nov. 30	238 2847.6	+387.16 E	+35 sin(10°E+235°)		23	–	1811–86
8588	–	. . . .		. . . .			–	–	
8591	220	1883 Mar. 16	240 8886	+360 E			5	6	1882–83, 90–93
8597	–	1879 Aug. 28	240 7590	+261 E			7	–	1879–92
8600	170	1854 July 14	=239 8414.0	+429.0 E	+23 sin(16°E+346°)		26	7	1850–92

* Subtract $3^h\ 24^m\ 44^s$ if epoch is odd.

NOTES TO THE CATALOGUE.

The following notes give, first, the facts with regard to the discovery of the variability of the several stars. For the stars contained in SCHÖNFELD's Second Catalogue, the name of the discoverer and the date, only, are given; except in special instances where, from any doubt that might exist as to the variability, the facts as to independent confirmation are added. For variables announced since that time, pains have been taken to supply also the name of the observer by whom the suspicion or discovery was first confirmed. The imperative necessity for requiring such independent verification, as a criterion for assigning ARGELANDER's letters and for insertion in the catalogue, has been adverted to on so many occasions, and the danger of departing from this course has been so forcibly illustrated in many instances, that the matter need not be further insisted upon here.

To facilitate the identification of the variables in their fainter stages, I have given, in as many cases as was convenient or possible, the positions, relative to the variable, of the neighboring fainter stars. (See *A.J.* VIII, 114.)

The other data in the notes relate mainly to peculiarities of the light-curves, etc. If space had permitted, these would have been much more complete. In the next edition of the catalogue it is hoped to incorporate, in compact form, the results of numerous original investigations in this direction, which will be useful to observers.

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100. Disc. by CHANDLER, 1881; conf. by SAWYER. Occasionally rudely periodic, 60–70 days, at other times irregular.

107. Disc. by KRUEGER, 1870. Light-curve flat at max., with sometimes a sec. min. near this phase. 8^M foll. 10^s, $0'.5$ N.

112. Disc. at Bonn, 1858. Sometimes has sec. phases following principal max. one or two months. 12^M pr. 3^s, $2'$ S; 9^M pr. 31^s on parallel.

114. Susp. by BORRELLY, 1872; proved by SCHÖNFELD. 12^M foll. 2^s, $4'.5$ S; 12^M pr. 3^s, $6'$ N.

116. TYCHO's star. Probable place according to ARGELANDER. Possibly identical with a $10^M.5$ now visible $0'.8$ N.

161. Disc. by LUTHER, 1855. SCHÖNFELD's obsns. show irregular periods, $2\frac{1}{2}$–5 mos.

209. Disc. by BIRT, 1831; conf. by Sir J. HERSCHEL and others. Var. only occasionally evident. ARGELANDER found per. 79^d, uncertain.

224. Disc. by HARTWIG, 1885. New star in *Andromeda* nebula.

243. Disc. by ESPIN, 1887; conf. by CHANDLER.

320. Disc. by CERASKI, 1880. *Algol*-type. Light-curve unusually flat at min., and unsymmetric; decrease more rapid than increase. Oscillations occupy one-sixth of period, or 10 hours; nearly stationary for 2 hours at minimum. See investigations *A.J.* IX, 49 and XIII, 45.

432. Disc. at Bonn, 1861. Light-curve variable. $9^M.6$ foll. 20^s, $2'$S; 12^M pr. 15^s, $0'.3$ S.

434. Disc. by HIND. 1851. $11^M.5$ foll. $0^s.5$, $0'.7$ N; 12^M directly S.

466. Disc. by PETERS, 1880; conf. by PARKHURST. For stars of ident. see *A.N.* 99, 114.

494. Disc. by GOULD, 1872; conf. by SAWYER.

513. Disc. by HIND, 1850. 11^M foll. 7^s, $0'.5$ N; 9^M pr. 9^s, $4'$ N.

678. Susp. by FLEMING, 1890; conf. by YENDELL and REED. Period perhaps about 6 mos.

715. Disc. by PETERS, 1865. $9^M.5$ pr. 10^s, $6'$S; $10^M.5$ foll. 5^s, $4'.5$ N.

782. Disc. at Bonn, 1857. Light-curve flat near max., 6^M pr. 23^s, $0'.7$ S.

793. Disc. by SAFARIK, 1882; conf. by CHANDLER and SCHWARZCHILD. Either irregular or rudely periodic, with period of several months.

806. Disc. by FABRICIUS, 1596; recognized as periodically var. by HOLWARDA, 1638. Principal epoch of elements in catalogue corresponds to Ep. 227 of ARGELANDER. $9^M.1$ foll. $7^s.7$, $10''$ N.

814. Disc. by KRUEGER, 1872. Probably irregular. SAFARIK and HAGEN think it is rudely periodic; period long, $2\frac{1}{2}$ years. 10^M foll. 2^s, $1'.1$ N.

845. Disc. by ARGELANDER, 1866. 11^M pr. 12^s, $5'$ N.

893. Disc. by SAWYER, 1885; conf. by CHANDLER.

906. Susp. by ESPIN, 1890; proved by YENDELL and KNOTT.

976. Disc. by AUWERS, 1870. Light-curve very flat near max.

1072. Disc. by SCHMIDT, 1854. SCHMIDT's period of $32^d.98$ not conf. by SCHÖNFELD's obsns.

1090. Susp. by MONTANARI, 1669; independently disc. by GOODRICKE, 1782. Additional term of elements, $+3^m.5 \sin(\frac{1}{6}°E+90°.33)$. Principal epoch of elements corresponds to Ep. 11210 of ARGELANDER. See investigations, *A.J.* VII, 165–183; XI, 113–126. Light oscillations occupy a little over 9 hours.

1113. Disc. by SCHAEBERLE, 1892; conf. by GLASENAPP. Position only rudely known.

1222. Disc. by SCHÖNFELD, 1861. 12^M foll. 5^s, $0'.2$ S; 12^M foll. 4^s, $1'.2$ S; 12^M pr. 12^s, $0'.5$ S.

1367. Disc. by GOULD, 1876; conf. by CHANDLER, also YENDELL.

1411. Disc. by BAXENDELL, 1848. Period certainly subject to inequalities, whose law it is not yet possible to determine. Deviations from uniform elements sometimes amount to 3 hours. The light-oscillations occupy 10 hours.

1537. Disc. by HIND; conf. by AUWERS and CHACORNAC, 1861. A supposed variable nebula (HIND and D'ARREST) precedes $2^m 38^s$, $6'.5$ S.

1574. Susp. by ESPIN, 1886; conf. by GAGE, CHANDLER and PARKHURST, although there is some doubt and confusion about its exact place. The region within 15′ should be watched.

1577. Disc. by HIND, 1849. 8^M pr. 15^s, 5′.5 S; 10^M foll. 3^s, 2′ N.

1582. Disc. by OUDEMANS, 1855. TOWNLEY thinks period is one-half of that in table. The small value of $M—m$ seems to favor this hypothesis, although there are no obsns. of max. to confirm it. $11^M.5$ foll. 9^s, 1′ S; $11^M.5$ foll. 4^s, 0′.7 S; 12^M pr. 6^s, 1′ N.

1623. Disc. by ESPIN, 1891; conf. by DUNÉR. Elements provisional and uncertain, from DUNÉR's two max.

1635. Disc. by RAGOONATHACHARI, 1867; conf. by ROBERTS.

1654. Disc. by GOULD, 1874; conf. by ROBERTS. Period about 11 mos., by ROBERTS's obsns.

1717. Disc. by AUWERS, 1871. $12^M.5$ foll. 11^s, 1′ S; $11^M.5$ foll. 10^s, 3′.5 N.

1761. Disc. by HIND, 1848. 11^M foll. 11^s, 0′.3 N; 12^M pr. 7^s, 0′.6 S.

1768. Susp. by FRITSCH, 1821; conf. by SCHMIDT, 1843; independently disc. by HEIS, 1847. Variations irregular, often unnoticeable during many months.

1771. Disc. by SCHMIDT, 1855. HIND's "crimson star." Accurate obsns. of max. and min. difficult.

1855. Disc. at Bonn, 1862. SCHÖNFELD notes, and CHANDLER's obsns. confirm, the unusual phenomenon of a "standstill" during increase at about 9^M, from 2 to 4 mos. before max. 9^M pr. 5^s, 0′.6 S.

1923. Disc. by DUNÉR, 1881; conf. by CHANDLER. Period irregular; probably over 400 days, with secondary phases.

1944. Disc. by WEBB, 1870; conf. by SCHÖNFELD. Marked irregularities, and secondary phases in light-curve. 10^M about 1′ N; $9^M.5$ pr. $2^s.5$, 0′.4 S.

1953. Disc. by ANDERSON, 1892. A secondary max. occurred in Aug., 1892, $9^M.2$. No apparent change in 6 mos. prec. Apr., 1893, according to PARKHURST.

1981. Disc. by ESPIN, 1891; conf. by YENDELL. Elements mere guess-work, from YENDELL's 3 max.

1986. Disc. by BOND, 1863. SCHMIDT's obsns. 1868–81, and CHANDLER's 1883–84, certainly confirm. While this is the only star in the nebula of *Orion* inserted in the Catalogue, there is little doubt that several others are variable. But the subject is a very intricate one, and requires especial investigation. See note to "unconfirmed list" with regard to STONE's and SCHMIDT's observations.

2013. Susp. by ESPIN, 1891; proved by YENDELL. Elements consistent with DM. obsns., but numeration of periods not certain.

2098. Disc. by Sir J. HERSCHEL, 1840. ARGELANDER found period of 196^d. SCHÖNFELD thought periodicity questionable.

2100. Disc. by GORE, 1885; generally confirmed. Elements deduced from combination of obsns. with various negative data, 1797–1857.

2213. Disc. by SCHMIDT, 1865. Elements will satisfy SCHMIDT's min. of 1844, which SCHÖNFELD's would not.

2258. Susp. by ESPIN, 1886; proved by CHANDLER, 1891; and YENDELL, 1893. Elements given are mere guess-work. They satisfy hypothetically all present data.

2266. Disc. by SCHÖNFELD, 1883; conf. by CHANDLER.

2279. Disc. by GOULD, 1871. Elements of First Catalogue retained, although not definitive. YENDELL gets 1885 Apr. 2.68 + 27.0059 E.

2362. Disc. by SCHMIDT, 1861. In southerly end of the nebula *h* 399.

2375. Disc. by WINNECKE, 1867. SCHÖNFELD's obsns. partly confirm partly contradict WINNECKE's elements. YENDELL's obsns. also render them doubtful. The star requires further investigation before the question can be settled.

2478. Disc. by KRUEGER, 1870–74; conf. by SCHÖNFELD. 10^M foll. 20^s, 2′.3 N; 10^M pr. 11^s, 3′.5 N.

2509. Disc. by SCHMIDT, 1847. Elements of First Cat. retained. Definitive investigation not completed.

2528. Disc. by HIND, 1848. Light-curve variable. Variations near max. frequently very slow. 12^M, 2′.5 N; $12^M.5$ pr. 4^s, 1′ S; 9^M foll. 25^s, 3′ N.

2539. Disc. at Bonn, 1855. Light-curve flat at max. Obsns. of LALANDE and BESSEL cannot yet be certainly included in calculation of elements.

2583. Disc. by GOULD, 1872; conf. by WILLIAMS and ROBERTS.

2610. Disc. by SAWYER, 1887; conf. by CHANDLER. Elements of Supplement (*A.J.* 216) retained, as recent obsns. give no certain correction. Light-oscillations occupy 5 hours.

2625. Disc. by BAXENDELL, 1880; conf. by KNOTT and CHANDLER.

2676. Disc. by GOULD, 1873. Elements of First Cat. retained. Definitive investigation not completed. Light-curve has rudely alternating bright and faint minima.

2684. Disc. by HIND, 1856. Light-curve flat at max. $9^M.5$ foll. 19^s, 4′ N; $9^M.3$ pr. 25^s, 3′ N.

2691. Disc. by SCHÖNFELD, 1865. $12^M.7$ pr. 1^s, 0′.3 S; $12^M.2$ foll. 4^s, 0′.1 N.

2735. Disc. by BAXENDELL, 1879; conf. by SCHMIDT. Period and light-curve very irregular, with secondary max. and min. Elements uncertain.

2742. Disc. by HIND, 1848. $11^M.5$ foll. 4^s, 0′.6 S; 12^M pr. 5^s, 1′.6 N.

2780. Disc. by HIND, 1848. A halt frequently occurs during increase, at about $9^M.5$. $12^M.5$ pr. 1^s, 2′.3 S; 11^M pr. 12^s, 3′ N.

2783. Disc. by GOULD, 1872?

2815. Disc. by HIND, 1855. Light-variation of a unique character. The star remains at or near min., about 13^M, most of the time, suddenly brightens to about $9^M.3$, and diminishes again in 5–12 days to min. Irregular periods, from two to five mos., average 86.3 days. For purpose of approx. prediction the epoch of last observed max. is given as epoch

of catalogue. For comparison-stars and light-scale see WINNECKE, *A.N.* 1120.

2852. Disc. by WILLIAMS, 1886; conf. by ROBERTS. The former thinks period is 4½ days; the latter, about half of this.

2857. Disc. by PICKERING, 1881; conf. by CHANDLER. Elements uncertain. 10^M foll. 26^s, 4′ N; 11^M pr. 16^s, 1′.5 N; 13^M foll. 2^s, 1′.5 S.

2946. Disc. by SCHWERD, 1829. 10^M foll. 6^s, 4′.4 S; 12^M pr. 4^s, 1′.5 S.

2976. Disc. by AUWERS, 1870. Occasionally secondary phases near max. 11^M foll. 4^s on parallel; $10^M.5$ foll. 18^s, 0′.3 N.

3060. Disc. by CHACORNAC, 1853. Light-variation, occasionally at least, slow near max. 11^M pr. 3^s, 7′ N.

3109. Disc. by HIND, 1848. SCHÖNFELD's elements retained, since 6 min. by YENDELL in 1890 give unimportant deviations. Light-oscillations occupy 21½ hours.

3128. Susp. by WEISS; proved by HOLETSCHEK, 1890. Period just about a year. This letter assigned because the var. of the star to which the letter *R* was assigned, (*Uran. Argent.* p. 297,) has not yet been confirmed.

3170. Disc. by HIND, 1848. Var. near max. sometimes slow, sometimes rapid. 11^M pr. 12^s on parallel; 12^M foll. 7^s, 0′.3 N.

3184. Disc. by HIND, 1851. 10^M foll. 6^s, 3′ N; $10^M.5$ pr. 4^s, 2′.5 N.

3186. Disc. by HIND, 1850. Elements give minimum-epoch only, as light-curve is too flat near max. to determine the latter.

3407. Disc. by PAUL, 1888; conf. by SAWYER. Period of Supplement to First Cat. (*A.J.* 216) retained, correcting Epoch by $-17^m.4$. Light-oscillations occupy about 3½ hours.

3409. Disc. by GOULD, 1871; conf. by ROBERTS. ROBERTS's obsns. not entirely consistent with GOULD's period of 4.25 days.

3418. Disc. by GOULD, 1871; conf. by TEBBUTT.

3477. Disc. by SCHÖNFELD, 1863. $10^M.5$ foll. 10^s, 2′ N.

3493. Disc. by KOCH, 1782. The periodical inequality of the elements is very certain.

3495. Disc. by GOULD, 1871; conf. by ROBERTS.

3567. Disc. by BECKER, 1882; conf. by CHANDLER. $11^M.5$ foll. 5^s, 1′.2 N.

3633. Disc. by GOULD, 1872; conf. by ROBERTS.

3637. Disc. by GOULD, 1871; conf. by ROBERTS. Light-curve regular.

3712. Disc. by PETERS, 1876. SCHÖNFELD thought it variable. Certainly seen by no one except PETERS and the DM. observers. The writer has never been able to see the star, although it was sought for many times in different years. PARKHURST's experience is similar. The variability is extremely doubtful.

3796. Disc. by GOULD, 1871; conf. by ESPIN and YENDELL. ESPIN's period not confirmed.

3825. Disc. by POGSON, 1853. Light-curve very variable.

3847. Disc. by BURCHELL, 1827. Fluctuations very capricious.

3881. Susp. by GOULD; proved by CHANDLER, 1888. Large irregularities in period. Elements uncertain.

3890. Disc. by PETERS, 1880; conf. by PARKHURST. A max. obsd. by YENDELL, 1893, contradicts PARKHURST's period. For stars of identification see *A.N.* 99, 114.

3908. Disc. by GOULD, 1877; conf. by UPTON and ROBERTS. The latter thinks periods is about 18^h.

3934. Disc. by WINNECKE, 1861. Variations very small, and, according to some observers, doubtful. SCHÖNFELD found, very uncertainly, period of 160^d, from WINNECKE's obsns. *α Crateris* pr. 43^s, 1′.2 N; 9^M pr. 5^s; $8^M.5$ foll. 10^s, 2′.5 S.

3994. Disc. by CHACORNAC, 1856. Increase apparently slower than decrease by CHANDLER's obsns. $11^M.5$ foll. 6^s, 1′.7 S.

4160. Disc. by PETERS, 1862. Variation not confirmed by any other observer, and indeed, from obsns. of SCHÖNFELD, PARKHURST and CHANDLER — none of whom have ever certainly seen the star — is subject to considerable doubt.

4300. Disc. by PETERS, 1871; conf. by SCHÖNFELD and CHANDLER. A period of about 340^d is consistent with a large part of the very defective data. $11^M.5$ foll. 2^s, 0′.4 N.

4315. Disc. by SCHÖNFELD, 1856. $7^M.5$ pr. 13^s, 2′.2 N.

4377. Disc. by BOGUSLAWSKI, 1849. 11^M pr. 8^s, 2′ N; 12^M foll. 1^s, 2′ N; $11^M.5$ foll. 12^s, 2′ N; $11^M.5$ pr. 2^s, 4′ N.

4407. Disc. by KARLINSKI, 1867. Increase rapid. 8^M pr. 5^s, 3′.5 S; 10^M pr. 5^s, 0′.5 N; 8^M foll. 18^s, 1′ S.

4492. Disc. by HENRY, 1874; conf. by CHANDLER. 8^M foll. 19^s, 1′ S; 11^M foll. 12^s, 2′.5 N.

4511. Disc. at Bonn, 1860.

4521. Disc. by HARDING, 1809. See investigation *A.J.* VIII, 164.

4536. Disc. by Gould, 1871; conf. by UPTON.

4557. Disc. by POGSON, 1853.

4596. Disc. by HARDING, 1831. Periodic inequality of small range indicated. 10^M pr. 9^s, 1′ N.

4731. Susp. by ESPIN, 1891; proved by YENDELL.

4805. Disc. by SCHÖNFELD, 1866. Light-curve very regular.

4816. Disc. by GOLDSCHMIDT, 1857. Increase somewhat irregular, decrease more uniform. Star isolated, and identification easy.

4826. Susp. by MONTANARI, 1672 (1670?); proved by MARALDI, 1704. Elements of catalogue are based on obsns. since 1784 only, the attempt to reconcile HEVEL's, MONTANARI's and MARALDI's max. having been given over for the present. The principal epoch of catalogue corresponds to Ep. 170 of investigation in *A.N.* 103, 225.

4847. Disc. by HIND, 1852.

4940. Disc. by SAWYER, 1888; conf. by YENDELL.

4948. Disc. by ESPIN, 1888; conf. by CHANDLER.

5037. Disc. by PETERS, 1880; conf. by PARKHURST.

5070. Disc. by PALISA, 1880; conf. by CHANDLER. 9^M pr. 12^s, $2'$ S; 10^M pr. 7^s, $2'$ N.

5095. Disc. by GOULD, 1871; conf. by ROBERTS.

5097. Disc. by BAXENDELL, 1860. Only one appearance known. SCHÖNFELD suggested that it may belong to the class of new stars.

5156. Disc. by BAXENDELL, 1859; conf. by CHANDLER, 1888, and YENDELL, 1893. $7^M.3$, directly south $2'.8$, renders obsn. difficult.

5157. Disc. at Bonn, 1860. Quadratic term of elements very certainly established.

5190. Disc. by HENCKE, 1858. Light-curve somewhat irregular.

5194. Disc. by DUNÉR, 1884; conf. by CHANDLER. Observed max. show considerable deviations.

5237. Disc. at Bonn, 1858.

5249. Disc. by SCHÖNFELD, 1882; conf. by CHANDLER.

5274. Disc. by SCHMIDT, 1867; conf. by SCHWAB.

5319. Disc. by GOULD, 187– (?); conf. by ROBERTS.

5338. Disc. by BAXENDELL, 1880; conf. by SCHWAB. PARKHURST suggests period to be lengthening ($P = 173^d.5 + 0^d.16\,E$).

5374. Disc. by SCHMIDT, 1859. Epoch of catalogue elements corresponds to Ep. 391 of SCHÖNFELD. SCHMIDT found an inequality of 9 yrs. cycle in period. I suspect that this is not real, but a subjective effect, dependent on hour-angle at which min. are obsd. The subject is reserved for definitive investigation. Light-oscillations occupy 12 hours.

5402. Disc. by GOULD, 187– (?); conf. by ROBERTS, who also confirms GOULD's period.

5430. Disc. by PALISA, 1878; conf. by CHANDLER. Period of first catalogue was 723^d. Townley discovered the subdivision. $10^M.5$ foll. 7^s on parallel; 13^M pr. 4^s, $0'.2$ N; $13^M.5$ pr. 1^s, $1'$ N.

5438. Disc. by BAUSCHINGER, 1887; conf. by CHANDLER. Period uncertain.

5465. Disc. by GOULD, 1871; conf. by ROBERTS.

5484. Disc. by WINNECKE, 1869. Elements of supplement, *A.J.* 216, retained, as they represent subsequent obsns. to date, without appreciable certain correction. See investigation *A.J.* IX, 97. Light-oscillations occupy nearly 10 hours.

5494. Disc. by BORRELLY, 1872. 13^M pr. 2^s, $2'$ N; $12^M.5$ foll. 5^s. $2'.5$ N.

5501. Disc. by HARDING, 1828. Increase more rapid than decrease. 11^M pr. 8^s, $0'.5$ N; $12^M.7$ foll. 2^s, $0'.4$ N.

5504. Disc. by HENCKE, 1860.

5583. Disc. by PETERS, 1878; conf. by PARKHURST. TOWNLEY suggested period of 169^d, in place of PETERS's of 295^d. PARKHURST suggests the elements 1878 July $27 + 112.6\,E$.

5593. Disc. by PETERS, 1878; conf. by PARKHURST.

5617. Disc. by PETERS, 1878; conf. by CHANDLER.

5644. Disc. by PETERS, 1879. Elements very uncertain. S. DM. gives R. A. 10^s smaller. Identification not certain.

5667. Disc. by PIGOTT, 1795. Remains frequently nearly unchanged, near max., then diminishes at irregular intervals suddenly to min., and after repeated large oscillations resumes its normal unchanging condition.

5675. Disc. by DUNÉR, 1878; conf. by SCHMIDT. Secondary phases near max. sometimes marked.

5677. Disc. by HARDING, 1826. Star isolated and identification easy.

5682. Disc. by GOULD, 1884.

5688. Disc. by POGSON, 1858. Not recently observed, and elements consequently not trustworthy for prediction. 12^M pr. 3^s, $1'.2$ S.

5704. Disc. by PETERS, 1885; conf. by PARKHURST.

5713. Disc. by GOULD, 187– (?); conf. by ROBERTS, who gives period as $6^d.3$.

5732. Disc. by BIRMINGHAM, 1866. See note to SCHÖNFELD's Second Catalogue for history of its appearance.

5758. Disc. by GORE, 1890; conf. by YENDELL.

5761. Disc. by PETERS, 1883; conf. by PARKHURST.

5770. Disc. at Bonn, 1855. Identification easy.

5776. Disc. by PETERS, 1876; conf. by PARKHURST.

5795. Disc. by PALISA, 1870; conf. by SCHMIDT. 10^M pr. 8^s, $1'$ N; 10^M foll. 10^s, $3'$ S.

5826. Disc. by AUWERS, 1860, independently by POGSON, one week later. Position, $0^s.29$ foll. $2''.7$ N of the center of cluster *Messier* 80. Not since seen.

5830. Disc. by CHACORNAC, 1853. Light-curve very variable; marked secondary phases. Increase from 12^M rapid. 8^M pr. 24^s, $2'$ N; 9^M foll. 10^s, $3'$ N.

5831. Disc. by CHACORNAC, 1854. $9^M.4$ foll. 9^s, $0'.2$ N.

5856. Disc. by SCHÖNFELD, 1881; conf. by CHANDLER. 11^M pr. 13^s on parallel; 12^M foll. 13^s, $4'$ N; 10^M foll. 34^s, $1'$ N.

5860. Disc. by POGSON, 1863. Decreased from 9^M to invisibility in 12 days. Not seen by any one else.

5887. Disc. by DUNÉR, 1881; conf. by CHANDLER.

5889. Disc. by HENCKE, 1860. Elements will not satisfy BESSEL's obsn., hence period is probably variable. 9^M pr. 12^s, $3'.3$ N.

5903. Disc. by PETERS, 1876; conf. by CHANDLER. Elements very uncertain.

5912. Disc. by BAXENDELL, 1857.

5928. Disc. by POGSON, 1860. Elements very uncertain. 10^M foll. 5^s, $9'$ S; 10^M pr. 5^s, $2'.5$ S.

5931. Disc. by POGSON, 1854. Recent obsns. confirm SCHÖNFELD's elements, which are retained. Light-curve variable. $11^M.5$ pr. 6^s, $3'$ N; 12^M pr. 13^s, $0'.2$ N.

5948. Disc. by PICKERING, 1881; conf. by CHANDLER. Period 4 to 6 mos., very irregular.

5950. Disc. by DUNÉR, 1880; conf. by CHANDLER.

5952. Disc. by CHANDLER, 1882; conf. by YENDELL. The former, in 1882–83, found period $20^d.5$; the latter in 1889–93, period of $20^d.6$.

5955. Disc. by GEELMUYDEN, 1876; conf. by HARTWIG. $8^M.5$ foll. 35^s, $1'.5$ S; 11^M foll. 2^s, $3'$ S.

6005. Susp. by ESPIN, 1892; proved by YENDELL.

6044. Disc. at Bonn, 1856. Decrease unusually rapid immediately after max. $9^M.7$ foll. 9^s, $1'.4$ S; 6^M foll. 11^s, $1'.9$ N.

6083. Disc. by HIND, 1848. At present visible as $12^M.5$, without change since 1867.

6132. Disc. by POGSON, 1853. $10^M.5$ foll. 6^s, $4'$ S; $10^M.5$ pr. 2^s, $6'$ S. Also a small nebula, not in HERSCHEL's G.C. or DREYER's supplement. foll. 36^s, $2'$ S.

6181. Disc. by W. HERSCHEL, 1795. Very irregular oscillations in periods of 2 to 4 mos.

6189. Disc. by GOULD, 1871; conf. in 1881 by SAWYER, who also first recognized its character as of the *Algol*-type. See investigations *A.J.* VII, 129–140, and XIII, 46. Light-oscillations occupy 5 hours.

6202. Disc. by SCHMIDT, 1869 (?). SCHMIDT gave period about 37–40 days. Very rapid secondary oscillations near min. remarked by SCHMIDT, and confirmed by SCHWAB.

6268. Disc. by BRUNOWSKI and FABRICIUS, 1604. See note to SCHÖNFELD's Second Catalogue.

6368. Disc. by SCHMIDT, 1866; obsns. to 1892 give no certain corr. to SCHONFELD's elements.

6404. Disc. by SAWYER, 1888; conf. by CHANDLER.

6472. Disc. by SCHMIDT, 1866; obsns. to 1892 give no correction to elements of supplement, *A.J.* No. 216.

6512. Disc. at Bonn, 1857. 10^M pr. 3^s, $0'.9$ N.

6573. Disc. by SAWYER, 1886; conf. by CHANDLER. Elements nearly definitive.

6624. Disc. by BAXENDELL, 1860. Recent obsns. confirm SCHÖNFELD's elements, which are retained. $11^M.5$ foll. 3^s, $0'.1$ N.

6636. Disc. by SCHMIDT, 1866. Elements not quite definitive.

6682. Disc. by ESPIN, 1886; conf. by CHANDLER.

6726. Disc. by WINNECKE, 1860. Irregularly variable in period of 3 to 5 mos.

6733. Disc. by PIGOTT, 1795. ARGELANDER found bright and faint minima, usually alternating, and this has been confirmed by all subsequent observers. Provisional elements of First Catalogue retained, pending the completion of full discussion.

6758. Disc. by GOODRICKE, 1784. Light-curve double. Secondary min. about midway. REED's provisional corr. of ARGELANDER's elements retained, pending final discussion.

6760. Disc. by THOME, 1872; conf. by UPTON.

6794. Disc. by BAXENDELL, 1856. Elements of First Catalogue retained.

6806. Disc. by SCHMIDT, 1866. The period of 6^d, found from his earlier obsns., not conf. by the later ones.

6811. Disc. by SCHMIDT, 1866. Period given in Catalogue is SCHMIDT's.

6812. Disc. by SCHMIDT, 1876.

6834. Recognized by various observers, KNOTT, 1871; SCHMIDT, 1872; SAFARIK, 1884; SAWYER, 1892.

6849. Disc. at Bonn, 1856. Secondary fluctuations near max. Light-curve very variable. $9^M.6$ pr. 12^s, $0'.3$ S; $10^M.6$ pr. 4^s, $0'.5$ N.

6903. Disc. by POGSON, 1863. Lack of recent obsns. makes prediction uncertain. $11^M.5$ foll. 10^s, $0'.5$ N.

6905. Disc. by POGSON, 1858. 11^M pr. 1^s, $0'.4$ S; $10^M.8$ pr. 4^s; $1'$ N.

6921. Disc. by POGSON, 1860. 11^M foll. 24^s, $2'.5$ S.

6923. Disc. by PETERS, 1888; conf. by PICKERING. No elements possible, from data available.

6984. Disc. by SAWYER, 1886; conf. by CHANDLER.

7045. Disc. by POGSON, 1852. *θ Cygni* pr. 22^s, $0'.7$ N; 9^M foll. 2^s, $1'.5$ N.

7085. Disc. by PICKERING, 1890; conf. by PORRO (?).

7101. Disc. by ANTHELM, 1670. See note to SCHÖNFELD's Second Catalogue.

7106. Susp. by HIND, 1861; proved by BAXENDELL, 1862. Periodical term of elements uncertain.

7120. Disc. by KIRCH, 1686. See investigation *A.J.* X, 103. $11^M.5$ pr. 10^s, $1'$ 9 S; $11^M.5$ foll. 3^s, $1'$ S; $11^M.5$ foll. 6^s, $0'.1$ N.

7124. Disc. by PIGOTT, 1784. Elements of First Catalogue retained, pending definitive discussion.

7149. Disc. by GORE, 1885; conf. by CHANDLER.

7192. Disc. by ESPIN, 1887; conf. by BAXENDELL, Jr.

7220. Disc. at Bonn, 1860. Coefficients of periodical inequality only approximate. Secondary phases near max. $8^M.9$ foll. 1^s, $0'.8$ N.

7234. Disc. by HIND, 1848. Want of recent obsns. makes elements uncertain for prediction. 13^M dist. $20''$, pos.-angle $355°$.

7242. Disc. by BAXENDELL, 1863. Extraordinary and unexplained irregularities in period. 9^M foll. 1^s, $1'.5$ S.

7252. Disc. by PETERS, 1872; conf. by PARKHURST and CHANDLER. For stars of identification see *A.N.* 109, 120.

7257. Disc. by BAXENDELL, 1859. Double light-curve, like *β Lyrae*. Second max. and second min. follow principal ones about 35^d, respectively. Reversals of light-curve occurred in 1874 and 1883, so that between these dates the secondary minima were fainter than the principal minima.

7259. Disc. by ESPIN, 1887; conf. by CHANDLER. DUNÉR thinks period may be 380^d; PARKHURST, 120^d; but it is doubtful whether the star is regularly periodic. Place from BESSEL. DM. decl. is $2'.4$ smaller.

7261. Found by HENCKE, 1851, and suspected to be an asteroid, until SCHÖNFELD, 1859, proved variability. 12^M pr. 2^s, $1'$ S.

7285. Disc. by JANSON, 1600.

7299. Disc. by KNOTT, 1871. KNOTT thinks brightness at minimum is systematically variable. $8^M.5$ foll. 5^s, $0'.7$ N.

7428. Disc. by BIRMINGHAM, 1881; conf. by SCHMIDT. Second max. follows principal one about two months.

7431. Disc. by BAXENDELL, 1860. $8^M.3$ pr. 1^s, $0'.9$ N.

7437. Disc. by CHANDLER, 1886; conf. by YENDELL. The

former finds brightness at min. variable; the latter confirms this fact, and thinks the phenomenon is periodic in a cycle of 21 periods. Elements not quite definitive.

7444. Disc. by BAXENDELL, 1863. Possibly a secondary max. near principal one. Decrease unusually rapid. 11^M pr. 3^s, 2′.7 N; $10^M.1$ foll. 12^s, 0′.1 N.

7446. Susp. by D'ARREST, 1874; conf. by ESPIN, GORE and CHANDLER.

7455. Disc. by POGSON, 1858. $8^M.5$ foll. 20^s, 7′ N; 10^M pr. 15^s, 6′ S.

7456. Disc. by ESPIN, 1888; conf. by CHANDLER, 1888; YENDELL, 1890.

7459. Disc. by SCHMIDT, 1864. Period about one year, by SCHMIDT's obsns. Light-variations exceedingly small, and for the most part unnoticeable. Variability not sufficiently confirmed to be regarded as certain.

7468. Disc. by GOLDSCHMIDT, 1861.

7483. Disc. by SAWYER, 1885; conf. by CHANDLER. Elements practically but not strictly definitive.

7488. Disc. by CHANDLER, 1886; conf. by SAWYER. *Algol*-type. The extraordinary anomalies signalized in *A.J.* VIII, 130 and IX, 92 are explained by DUNÉR *A.J.* XII, 1, whose elements are adopted in the Catalogue. DUNÉR gives also the additional term $\pm 2^s.2$ (E-792), where upper sign is for even epochs, lower for odd. CHANDLER found brightness at min. to be variable, and YENDELL's obsns. confirm. Light-oscillations occupy about 8 hours.

7560. Disc. at Bonn, 1858. $9^M.5$ foll. 6^s, 0′.3 N.

7571. Disc. by PETERS, 1867; conf. by PARKHURST. For stars of identification see *A.N.* 109; 121.

7577. Disc. by PETERS, 1872; conf. by PARKHURST. For stars of identification see *A.N.* 109; 122.

7609. Disc. by CERASKI, 1878; conf. by KNOTT.

7659. Disc. by HIND, 1854. 9^M pr. 5^s, 3′.9 N.

7733. Disc. by PETERS, 1884; conf. by PARKHURST. Period may perhaps be 412^d, or double that of the Catalogue.

7754. Disc. by GORE, 1885; conf. by SAWYER.

7779. Disc. by HENCKE, 1858. Light-curve flat at max.

7783. Susp. by ESPIN, 1890; proved by YENDELL and REED.

7787. Disc. by SCHMIDT, 1876.

7795. Disc. by SAFARIK, 1885, and independently by YENDELL, 1892; conf. by SAWYER and PARKHURST. YENDELL thinks period is about 470^d.

7803. Susp. by HIND, 1848; conf. by ARGELANDER. ARGELANDER's period of 432^d not borne out by SCHMIDT's and other obsns.

7907. Disc. by PETERS, 1881; conf. by PARKHURST.

7909. Susp. by WEISS; proved by HOLETSCHEK, 1890.

7944. Disc. by HIND, 1863. 11^M pr. 13^s, 1′.5 N. R.A. of DM. is 6^s too small.

7994. Disc. by GOULD, 1884.

8068. Susp. by FLEMING, 1891; proved by REED, 1893.

8073. Disc. by GOODRICKE, 1784. The variation of the period indicated by the elements is certain.

8093. Disc. by GOULD, 1884.

8153. Disc. by DEICHMÜLLER, 1883; conf. by CHANDLER. Increase from 13^M to 10^M very rapid. $9^M.3$ foll. 20^s, 2′.8 N; 11^M foll. 7^s, 2′.8 N; 11^M pr. 13^s, 2′.5 N.

8230. Disc. by ARGELANDER, 1853. Decrease from 10^M rapid. $7^M.5$ foll. 31^s, 4′ N; 10^M foll. 9^s, 3′ S.

8273. Disc. by SCHMIDT, 1847. ARGELANDER found period 41 days; SCHÖNFELD thinks irregular oscillations, in period of 30–50 days, more probable.

8290. Disc. by HIND, 1848. 11^M foll. 10^s, 0′.2 N; $10^M.5$ pr. 9^s, 3′ N.

8373. Disc by MARTH, 1864 (?). No faint stars near, and identification easy. Increase from 11^M rather slow.

8512. Disc. by HARDING, 1811. Identification easy. Increase from 10^M quite rapid.

8588. Disc. by GOULD, 1884.

8591. Disc. by CHANDLER, 1882; conf. by YENDELL and SAWYER.

8597. Disc. by PETERS, 1879; conf. by PARKHURST. For stars of identification, see *A.N.* 109, 123.

8600. Disc. by POGSON, 1853. 10^M pr. $0^s.5$, 0′.6 N.

LIST OF UNCONFIRMED STARS.

The following list is to a certain extent heterogeneous, and makes no pretension to completeness; that is, it by no means contains all the stars which, even in the last few years, have been alleged to be variable. It may be best described as a list of stars whose variations are plausible, at least, and therefore which require the attention of observers. No personal opinion is implied, or should be inferred, as to the variability of the stars, from the selection of these objects. There is no doubt that many of them are variable, and that some of them are not. Of the former class may be mentioned those of GOULD and SAWYER, whose critical authority is not open to question. In this connection it may be mentioned that six of the variables of the *Uranometria Argentina*, excluded from the First Catalogue, merely for want of independent verification, have been since confirmed, and will be found in the preceding Catalogue.

With regard to ESPIN's and FLEMING's stars, a watch by independent observers shows yet no trace of variation in many of them. I do not presume to account for this fact, but mention it as a justification for adhering to the rules, even while there is reason to regard the variability of many of them as highly probable. Similarly, the particularity of the evidence adduced by ROBERTS for several of his stars,— including apparently well-determined periods,— would seem

to entitle the results of this industrious observer to confidence. The number of variables of short period announced by him, within such a limited time, is in every respect remarkable.

Observers may be embarrassed in identifying some of the stars by means of the positions here given. In many cases discordant data have been published in different places by the original observer; the differences sometimes amounting to several minutes of arc; for instance, (1018), (2141), (3055), (5174), (6275), (7139), (8499), (8594). It is hoped that this unfortunate want of care will disappear in future announcements. It has been assumed that the latest published positions are more nearly correct.

The list contains also four stars,—(1961), (6088), (6633), (7194),—which have heretofore appeared in the catalogues of known variables, but which subsequent observation has disproved, or rendered extremely doubtful.

No further explanation is needed, except that, in the column of remarks, the abbreviations Y., Pkt., R. and C., stand for YENDELL, PARKHURST, REED and CHANDLER.

No.	Star	1855.0 R.A.	1855.0 Decl.	Supposed limits	Observer	Remarks
		h m s	° ′	M M		
(294)	– Cassiopeae	0 46 21	+57 46.5	8.4– 9.5	Espin	
(571)	– Ceti	1 33 0	— 7 21.6	8.4– 9.2	Safarik	Period over 4 mos.?
(691)	– Persei	1 52 6	+56 2	9.3–15	Fleming	Y. and R. do not confirm. See note
(1018)	– Horologii	2 48 12	—50 32	6.2– 9.7	Fleming	
(1220)	– Camelopardalis	3 19 53	+58 1.6	8.5–10?	Espin	
(1279)	– Camelopardalis	29 23	+62 10.4	7.3– 8.8	Fleming	Y. and R. do not confirm
(1344)	– Persei	3 41 9	+35 16.7	9– ?	Kam	C. found it invis. 1888 Apr. and Aug.
(1636)	– Reticuli	4 32 3	—63 7.4	5.8– 6.4	?	R. says period probably long
(1662)	– Caelum	35 30	—38 31	7.5–10.5	Fleming	
(1709)	– Tauri	42 20	+15 31.7	8.0– 9.4	Espin	
(1745)	(R) Eridani	48 48	—16 39.3	5.4– 6.0	Gould	S's obsns. show no change
(1772)	(S) Eridani	53 11	—12 45.1	4.7– 5.7	Gould	S's " " " "
(1801)	– Camelopardalis	55 36	+68 18.7	7.8– ?	Espin	
(1805)	– Orionis	4 58 25	+ 3 54.1	9–11.5	Boss	
(1945)	– Orionis	5 21 48	— 4 49.1	10.9–13<	Safarik	Near *S Orionis*
(1948)	31 Orionis	22 22	— 1 11.7	4.7– 6	Gould	Gore's obsns. app. conf.; Y's do not
(1961)	δ Orionis	24 36	— 0 24.6	2.2– 2.7		See note
(1988)	– Orionis	29 –	— 5 34	. .		See note
(2170)	– Leporis	5 59 47	—24 11.1	6.7– 7.5	Sawyer	Period 69^d. See note
(2141)	– Octantis	6 10 33	—86 25.7	7.4–<11.3	Fleming	
(2305)	– Lyncis	20 14	+58 50.6	7.5– 9	Kreutz	C. and Y. do not yet confirm
(2445)	– Monocerotis	6 45 17	— 6 58.2	8.8–10?	Espin	
(2659)	– Canis Majoris	7 21 3	—11 15.9	6.3	Espin	S., Y. and C. find star constant
(2741)	(R) Puppis	35 15	—31 19.6	6.5– 7.5	Gould	S. and C. find no certain var.
(2788)	(T) Puppis	7 43 11	—40 17.5	6.5– 7.2	Gould	
(2903)	– Cancri	8 1 16	+19 50.0	9.7– ?	Peters	Pkt. and C. cannot yet confirm
(3055)	– Carinae	28 8	—58 44.1	7.2– 8.0	Roberts	Period 6^d.66. See note
(3087)	– Velorum	32 58	—46 51.3	7.5– 8.5	Roberts	Period 4^d.6
(3197)	– Cancri	8 50 23	+11 23.4	8.5– 9.3?	Baxendell, jr.	
(3355)	– Carinae	9 17 53	—55 20.5	7.5– 8.5	Roberts	Period 4^d.38
(3614)	(R) Velorum	10 0 42	—51 29.0	6.5– 7.5	Gould	
(3911)	– Carinae	10 51 54	—58 27.4	6.7– 8.5	Roberts	Elements, 1892 Feb. 1 + 38^d.6 E
(4364)	– Muscae	12 5 1	—69 20.7	6.5– 7.3	Roberts	Elements, 1892 Jan. 3.6 + 9^d.66 E
(4429)	– Crucis	15 42	—60 49.5	6.8– 8.0	Roberts	Elements, 1891 Dec. 25 + 5^d.827 E
(4435)	– Centauri	16 48	—48 38.2	6– ?	Pickering	
(4495)	β Corvi	26 47	—22 35.7	. .	Gould and Sawyer.	See note
(4611)	– Crucis	12 45 49	—57 38.5	6.8– 7.6	Roberts	Elements, 1892 Jan. 2.4 + 4.84 E
(4856)	– Virginis	13 26 58	—12 28.0	5.5– 6.5	Schmidt	*U.A.* obsns. confirm.; S's do not
(4905)	– Canum Venat.	13 35 29	+29 6.7	. .	Pickering	20″ S. of center of neb. G.C. 3636
(5076)	– Bootis	14 3 55	+10 30.1	8.7–12	Pogson	

No.	Star	1855.0 R.A.	1855.0 Decl.	Supposed limits	Observer	Remarks
		h m s	° ′	M M		
(5174)	– Virginis	14 20 15	+ 5 19.3	8.2–10.7	Fleming	See note
(5481)	– Librae	15 11 15	+ 2 36.9	9.5–12	Packer	See note
(5511)	– Librae	15 53	—22 24.2	8.4–<11	Fleming	
(5626)	– Librae	15 35 17	—10 27.7	7.0– 8.8	Weisse	Per. about 4 mos. C's obsns. favor
(5823)	– Normae	16 6 52	—57 32.1	6.5– 7.4	Roberts	Period $9^d.75$
(5949)	– Arae	27 43	—56 41.8	6.9– 8.0	Roberts	Period $4^d.422$
(6050)	– Scorpii	45 7	—44 51.6	7–11.4	Fleming	
(6088)	(V)Herculis	16 52 58	+35 17.4	9.5–11.7	Baxendell	Removed from Catal. See note
(6275)	– Octantis	17 6 17	—86 43.1	8.2–<11.7	Fleming	
(6470)	– Ophiuchi	17 56 7	+ 2 30.5	8.2– 8.8	Safarik	Period $58^d.2$
(6502)	o Herculis	18 1 54	+28 44.4	3.4– 3.8	Schwab	See note
(6546)	– Sagittarii	8 0	—34 9.1	6.2– 7.4	Gould	
(6633)	(V)Sagittarii	22 54	—18 21.5	7.6– 8.8	Quirling	Removed from Catal. See note
(6749)	– Scuti	18 42 28	— 8 1.0	7.1– 9.5	Birmingham	C's obsns. favor
(6915)	– Sagittarii	19 9 53	—19 19.4	9.4–10.1	Safarik	Near *S Sagittarii*
(6943)	– Sagittae	15 13	+17 23.1	8.3– 9.9	Espin	Y's and C's obsns. favor somewhat
(7010)	– Sagittae	26 15	+17 26.0	6.3–<13	Chandler	See note
(7020)	– Sagittarii	27 13	—25 2.0	5.2– 6.7	Gould	S's few obsns. do not confirm
(7139)	– Sagittarii	46 54	—29 34.0	7.5–<12.6	Fleming	
(7151)	– Sagittarii	48 34	—42 13.9	8–<12.6	Fleming	
(7182)	– Cygni	55 18	+30 25.6	9– ?	Espin	
(7205)	– Cygni	19 59 6	+36 24.8	8.0– 9.2	Espin	
(7240)	– Cygni	20 4 55	+35 31.0	8.5– 9.5	Espin	
(7238)	– Cygni	5 3	+47 25.4	7.7– 8.9	Espin	C's obsns. do not confirm
(7264)	– Sagittarii	7 42	—39 33	7.7–10.7	Fleming	
(7268)	– Capricorni	8 37	—21 45.6	7.0– 7.7	Safarik	Secchi and Gore also suspect
(7280)	– Cygni	11 45	+39 54.9	5.2–8.0	Espin	Y's obsns. do not confirm
(7279)	– Cygni	11 53	+49 29.6	8.7– 9.6	Espin	
(7302)	– Capricorni	14 28	—16 28.2	10.4–<12	Pogson	
(7351)	– Cygni	23 34	+39 29.9	7.7– 9.2	Espin	Y's obsns. do not confirm
(7194)	(R)Cephei	34 37	+88 41.0	5?–10?	Pogson	Removed from Catal. See note
(7435)	– Cygni	37 50	+46 30.1	9.2–11.5	Espin	
(7450)	– Aquarii	39 30	+ 1 54.6	8.2– 9.0	DeBall	
(7452)	– Cygni	40 15	+40 33.7	9.5–11	Espin	
(7457)	– Aquarii	40 43	— 4 35.8	8.3– 9.6	Fleming	
(7458)	– Delphini	41 4	+18 48	9?–12?	Fleming	Y's obsns. do not yet confirm
(7481)	– Cygni	45 13	+33 57.1	7.9– 9.0	Yendell	
(7502)	– Vulpeculae	20 48 24	+27 30.5	4.9– 6.4	Yendell	
(7579)	63f_2Cygni	21 1 37	+47 3.9	4.7– 6.0	Espin	See note
(77·4)	– Cygni	21 35 46	+53 40.0	7.5– 9.0	Espin	
(8006)	– Cephei	22 12 44	+56 15.7	8.4– 9.5	Krentz	
(8100)	– Cephei	28 3	+55 52.6	5.8– 6.8	Yendell	
(8104)	– Aquarii	28 17	— 8 20.8	9–11.5	Hind	See note
(8106)	– Pegasi	28 48	+ 8 14.0	9.5–<13	DeBall	
(8116)	– Cephei	22 30 56	+57 40.7	7.0– 8.0	Espin	"Period probably short"
(8499)	104 Aquarii	23 34 14	—18 37.2	4.7– 5.1	Jones	Period $19^d.6$. See note
(8528)	19 Piscium	39 0	+ 2 40.8	4.8– 6.0	Gould	See note
(8594)	– Tucanae	50 0	—66 11	10.2–<12.6	Fleming	
(8617)	– Cassiopeae	53 54	+59 33.1	8–9 ?	Secchi	See note
(5)	– Ceti	23 58 30	—15 14.3	6.5–9	Tacubaya Observatory	

NOTES TO LIST OF UNCONFIRMED STARS.

(691). The letter V, which at one time seemed justified (see *A.J.* XIII, 13), must be withheld for the present.

(1961). After careful consideration of all the facts, this star has been removed from the Catalogue. Neither SAWYER, YENDELL, nor CHANDLER finds the slightest variation, so that the star, even if variable at times within the range of accidental error of obsn., must belong to that large class of similar objects, which for the present do not seem to belong properly among the recognized variables.

(1988). There are several stars in the great nebula in *Orion*, which have been strongly suspected, or alleged to be variable. Only one of these, 1986 *T Orionis*, appears yet to have been sufficiently confirmed to enter into the Catalogue. SCHMIDT also found evidence of var. in B 746 and B 784; but my careful watch of these in 1883-84, resulted in no certain confirmation of their var. STONE has carefully observed the region for several years, and finds probable fluctuation in 575, 589, 622 and 647. He also confirms HOLDEN's suspicions as to 641. STONE also finds that the relative brightness of 612 and 618, and of 671 and 676, seems to be variable. But he finds 675 invariable.

(2170). The fact that SAWYER has never announced a star as variable which has not proved to be so, gives reason to regard the variability of this star as certain. But since it has not been observed by any one else, the letter must be withheld.

3055? This star cannot be certainly identified on account of diverse data given by ROBERTS, who identifies it with Lac. 3393 [(1855) $8^h\ 25^m\ 46^s$, $-59°\ 38'.3$], but also gives a chart putting it at about (1855) $8^h\ 26^m\pm$, $-58°\ 40'\pm$. On the other hand, the identification by PICKERING, *A.J.* XIII, 79, agrees with neither place, and seems improbable from the magnitude, 9, assigned in the *Cord. Z. Catal.* The singular confirmation by the H. C. O. photographs of the variation of a star apparently not the variable, is thus unaccounted for.

(4495). From GOULD's and SAWYER's evidence, the var. of *β Corvi*, by a magnitude, seems certain, but it seems best to await other confirmation, in so difficult a case, before inserting it in the Catalogue.

(5174). This star, which HARTWIG calls *W Bootis*, is not in *Bootes*, but in *Virgo* (see *A.J.* XIII, 13), nor has its variation been yet confirmed, to my knowledge.

(5481). PACKER says two stars in 5 *M. Librae* are variable. For description and particulars, see *A.N.* 125, 157.

(6088). This star has been taken out of the Catalogue. It was inserted as *V Herculis*, in one of the *V.J.S.* ephemerides many years ago, but I know of no evidence of var. beyond a single obsn. of BAXENDELL. On the other hand, in a continuous watch of it for two years, and occasionally in other years, I found its light absolutely constant. PARKHURST's obsns. give equally good evidence to the same effect; and YENDELL's also lead to the same conclusion.

(6502). SCHWAB in 1878 thought variable by $0^M.3$ or $0^M.4$, in period of $6\frac{1}{2}$ days. CHANDLER several years previously had thought the relative difference between *o* and *ξ Herculis* to be variable. OUDEMANS had also noticed that the difference between *θ* and *o* was different from that assigned by ARGELANDER's obsns. HAGEN, also, thought *o* slightly var. See, too, WOLFF's *Photom Unters.* and SAFARIK's remarks, *V.J.S.* XVII, 93.

(6633). Removed from the Catalogue for the reasons given in the note to (1961), which apply here equally.

(7010). I have given the evidence which, it seems to me, render the variability almost certain, in the *Science Observer*, Nos. 43-44, Vol. IV. It lies $0^s.7$ foll, north $2'.2$, DM. +17.3997. I have looked for it at least fifty times unsuccessfully, when it must have been below 13.

(7194). Removed from the Catalogue for the same reasons as given for (1961) and (6633).

(7458). HARTWIG calls this star *U Delphini*. But, even if its variation be confirmed, this is a wrong designation, for there is already a star bearing this letter. See supplement to 1st Catalogue, *A.J.* no. 216.

(7579). ESPIN alleges as variable from 4.7 to 6.0, in long or irregular period; but my observations, some of them nearly coincident in date with his, contradict them and give no support to the idea of fluctuation. SAWYER also thinks the star is constant. It is very red and difficult to observe.

(8104). Suspected by HIND, having been estimated by him as $9^M.5$, but generally as 11^M. ARGELANDER thought it not variable, but SCHÖNFELD was inclined to think var. not improbable. KNOTT's observations in 1884 gave $11^M.7$. My observations too few to decide.

(8499). JONES of Haverford College observed several max. and min. giving the period $19^d.6$. From the place he gives, there remains a doubt whether the star observed was 103 or 104 *A Aquarii*.

(8528). GOULD was inclined to suspect variability, and obsns. of GORE, ESPIN and MARKWICK seem to favor. SAWYER's and mine do not confirm, and I am strongly of the opinion that the red color is reponsible for much, if not all, of the observed contradiction in the estimates.

(8617). SECCHI marked this as "var.?" My own obsns. in 1875 led me independently to suspect it, at first; but I afterwards concluded that the trouble lay entirely in the difficulty of estimating properly this very red star so close to a bluish companion.

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